APRIL, 1955

PIPE LINE INDUSTRY

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CONSTRUCTION • OPERATIONS • MAINTENANCE

Gas Jet Compressors

These ingenious devices provide a low-cost method of putting low-pressure gas into high-pressure lines, using local high-pressure gas for motive power. They have no moving parts and are almost maintenance free. Page 32

Flame Cleaner

An outstanding new machine that can remove five-eighths inch oxide scale and clean and prime pipe while moving down the line at 500 feet per hour. The cost is only a few cents a foot. Page 38

Microwave Radio

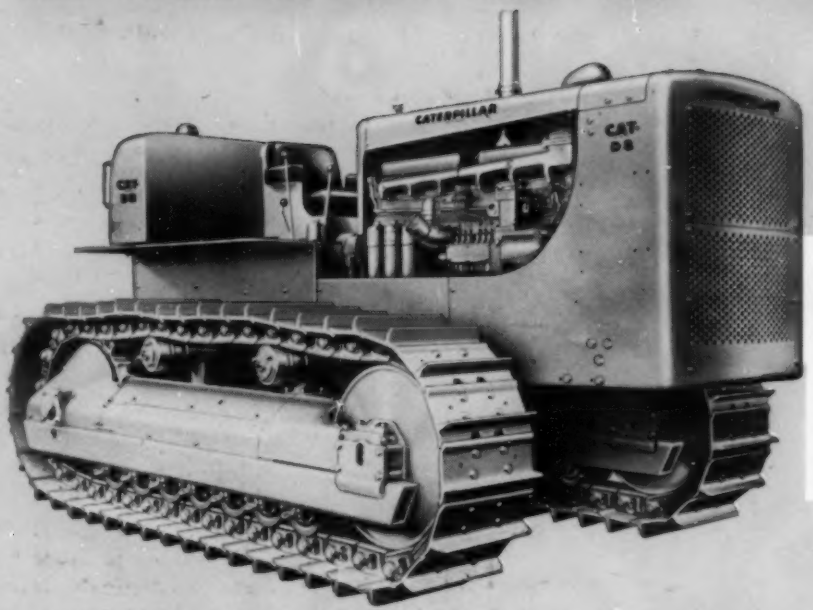
With the cost of changing a $3 tube amounting to $25, pipeliners have some definite ideas about what they want in microwave radio units - including more rugged equipment. Page 48

Turn page for additional contents and a Quick Review of this Issue

Subscription price $2 per year

Single copy price 50 cents

CATERPILLAR ANNOUNCES THE NEW D8



SERIES D and SERIES E

Choice of torque converter (Series D) or direct drive (Series E)

Here's a major advance in tractor design—the new CAT* D8 Series D and Series E. While it still bears the name of the unit that earned world-wide recognition as "boss of the crawlers," it is basically a *new* machine.

From its new 7-track roller track frame to its new engine, 155 HP at the drawbar and 191 HP at 1200 r.p.m., it is built to set new standards of money-making production. Along with its advance-design features, it retains such outstanding Caterpillar exclusives as the oil clutch and other job-proved developments. As a result, you can figure on it for *more* work at *lower* cost with *less* down time on *any* job.

Production-wise and profit-wise, you have a new yardstick of performance in the D8 Series D and Series E. For complete details, see your nearby Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

***NEW* ENGINE,** with new fuel injection system. Flanged center main bearing to take crankshaft thrust. Timing gear integral with crankshaft. Many other advantages.

***NEW* "LIVE-SHAFT" DRIVE,** independent of flywheel clutch, provides constant power for rear-mounted cable controls, etc., whether or not tractor is in gear.

***NEW* ONE-PIECE WELDED STEERING CLUTCH CASE**—main frame assembly for a stronger "backbone." Transmission removable without disturbing clutch.

***NEW* "EASY WORKING" CONTROLS** handy to comfortable, one-man seat. New streamlined hood for visibility.

***NEW* OPTIONAL DRIVE,** torque converter or direct drive. Torque multiplication of 5 to 1 gives smooth, efficient operation in each speed range.

***NEW* 7-ROLLER TRACK FRAME FOR GREATER STABILITY,** flotation and better ride.

***NEW* "WATER-QUENCHED" TRACK SHOES** for longer life than ever before.

***NEW* "IN SEAT" STARTING** for greater convenience, with new, more powerful starting engine for faster starts in any weather.

***NEW* HYDRAULIC BOOSTER STEERING,** independent of flywheel clutch, for maximum steering ease.

***NEW* 118-GALLON FUEL TANK,** large enough for normal 12-hour operation.

***NEW* ATTACHMENTS** include new cable controls. Also, new, larger bulldozer blades. All equipment used on the D8 can be used on the new D8 Series D and Series E.

NEW operating weight—D8 Series E (direct drive), 40,430 lb.; Series D (torque converter), 41,265 lb.

AND MANY OTHER NEW FEATURES!

MAIL TODAY!

CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

I'd like more information on the new D8 Series D and Series E

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

The NEW D8 Tractor —another example of CATERPILLAR LEADERSHIP in action

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PIPE LINE INDUSTRY

CONTENTS and Quick Review

April, 1955 Vol. 2, No. 4

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Who Owns Employe Inventions?

☐ When an employe invents a patentable device, who owns it? Who should patent it? Unless you know, there's trouble ahead. Here is some basic information that probably will enable you to sidestep expensive pitfalls.

By Arthur N. Bishop.....Page 26

You Can Calculate Faster

☐ Two new mathematical charts provide the means of speedier calculations. Multiplication, division, square root, cube root or what have you . . . the method is faster than slide rules and twice as rapid as a calculator. There is a handy chart you can clip and keep under the glass on your desk.

By E. J. George.....Page 30

Designing and Operating Gas Jet Compressors

☐ Gas jet compressors offer the gas producer a low-cost method of putting relatively low-pressure gas into higher pressure lines. This ingenious device has no moving parts and is practically maintenance-free. It works on the Venturi principal and has been on tests in the field for more than a year.

By Frank H. Dotterweich and C. V. Mooney.....Page 32

Flame-Cleaning Machine Removes Scale

☐ A flame-cleaner for pipe lines. This machine vaporizes moisture in oxide scales and pops them off the line. The difference in coefficient of expansion between oxides and parent metal also contributes to removing the scale which until now has defied field methods.

By B. Leonard Sherrod.....Page 38

How Stream Blending Works

☐ Shell Products Pipeline's stream blending plant at Wood River represents the final step towards eliminating batch processing. Blending is a continuous and automatic process. The plant even goes further and delivers directly into pipe lines.

By Rudy Lowe.....Page 40

Automation in Action

☐ One of the six booster stations recently completed in Platte Pipe Line Company's expansion program carries out the latest applications of pipe line station automation. For a description and pictures, turn to.....Page 46

What the Pipeliner Wants in Microwave Radio

☐ Here is an electronic lesson in common sense. When it costs $25 to change a $3 radio tube the answer appears to be a more expensive and more rugged tube. The electrical efficiency of a microwave unit on a pipe line and its low initial cost are insignificant compared with the number of maintenance calls necessary to keep the units operating.

By F. Vinton Long.....Page 48

How to Give Orders

☐ Almost every situation where orders are given is unique. Circumstances vary with the individual employes. Here are some helpful hints for pipeliners who must be leaders.

By Auren Uris.....Page 54

Information at your fingertips . . .

So you want more information on products advertised in PLI . . . on new equipment editorial items . . . on new equipment literature. Well, it's as easy as **A B C** when you use the Readers' Service blue postcards on the last page of each issue of PLI.

All you have to do is circle the code numbers on the postcards for more data on new equipment items . . . or the page numbers for more information on advertised products. Print in your name and address. Drop the card in your outgoing mail box. We pay the postage.

Before you can say "PLI means the best in pipe line reading" (well, almost), the return mail will bring you the information you requested.

Convenient . . . complete . . . and quick. That best describes the service available to you through the Readers' Service postcards in each issue of PLI.

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Excess Capacity Creates Problems

The petroleum industry of the United States has far more than fulfilled the government established goal of enough capacity to produce, transport and refine 1 million barrels a day in excess of current requirements. Capacity to produce and refine is more than 1½ million barrels greater than current daily needs. This makes the industry capable of meeting a sudden national emergency.

This represents a remarkable accomplishment, in view of greatly increased consuming and producing rates. U. S. daily consumption today is 3 million barrels or two-thirds greater than in 1946. The ability to produce and refine 1½ million barrels more than current rates has been achieved although production has increased by 1¾ million barrels daily and crude runs to refinery stills have risen nearly 2½ million barrels since 1946.

Once again, as it has many times before, the petroleum industry of the U. S. has demonstrated both its ability and willingness to adequately supply all of the nation's oil needs.

•

While desirable as a national defense cushion, surplus producing and refining capacity confronts the industry with serious operating problems. Surplus capacity of this magnitude creates a constant threat of too much crude and refined products. Excessive stocks can be accumulated quickly and easily under such conditions.

The industry, therefore, must learn to live with surplus capacity. Operating levels must be regulated to needs so excessive supply will not wreck the industry's economic position. The situation is not a temporary condition. Surplus capacity is going to be with the industry for many years to come, and the industry will be faced with the necessity of constantly exercising extreme caution for many years to come.

Before World War II, the industry successfully operated with a producing capacity far in excess of its current needs. It can again operate under similar conditions. State conservation agencies provide a means of regulating crude production to needs. It will not always be easy and some producers will experience hardships, but as a whole production can be regulated to proper levels.

•

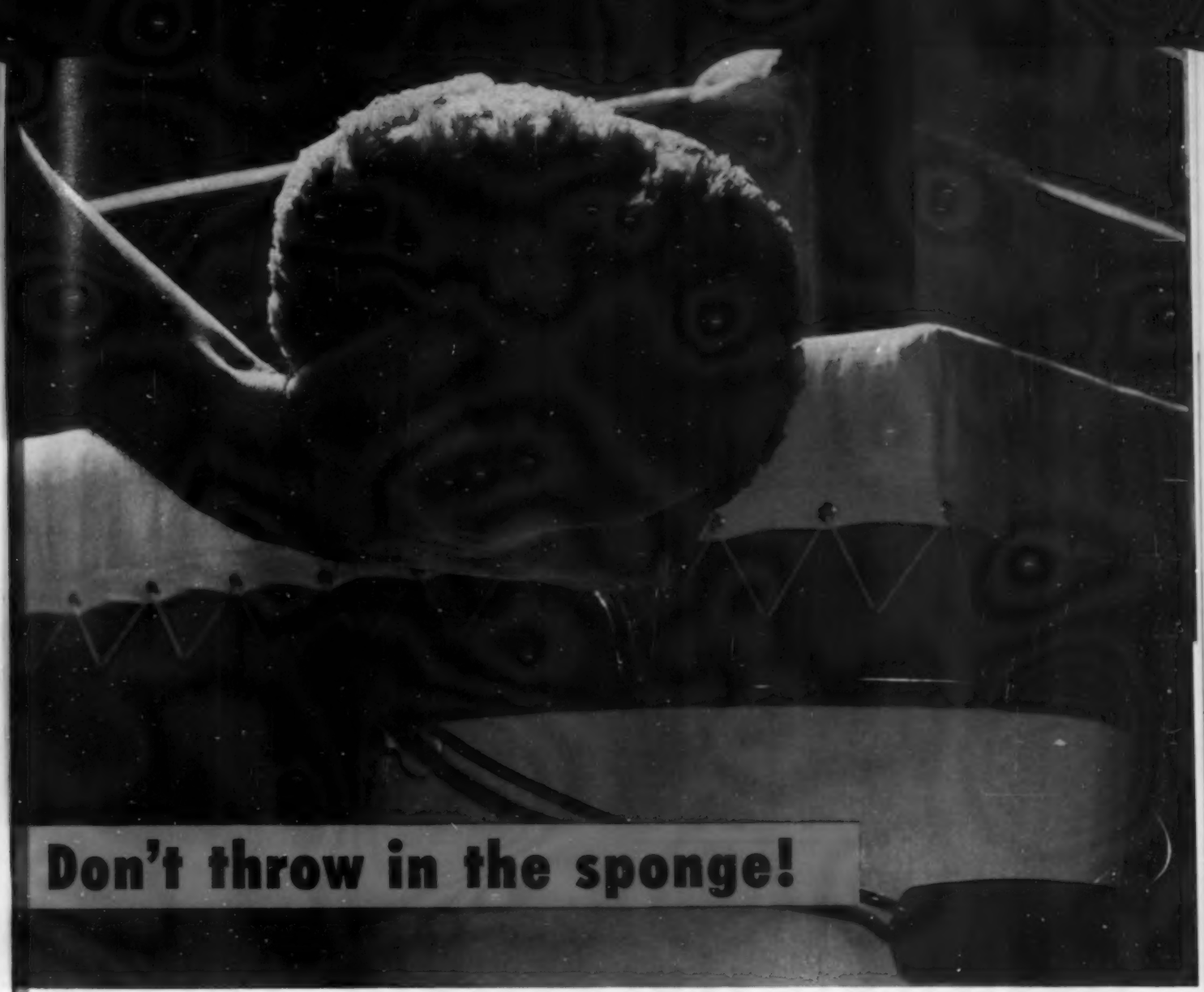
More difficulty will be experienced in the regulation of refining output to needs. Having invested a great many million dollars in new facilities, owners naturally want to put them in use. No means are available for the regulation of refinery operations—and no one should want any sort of government control.

Therefore, the proper regulation of refining output to current consumption levels must depend upon the voluntary individual action. This thrusts a heavy responsibility upon the refining branch of the industry. Stocks and other market trends must be watched more closely than ever before, and every company must be willing to do its fair share of reducing refinery output or adjusting product yields.

How well the industry succeeds in meeting the situation on a voluntary basis will determine whether all branches of the industry enjoy good conditions or suffer from weakened markets. Excessive output not only will cause price cuts, but result in small refiners demanding protective regulation.

The wise course for the industry will be to try and solve the refining problem on a voluntary individual basis. The burden will fall heavily upon the major companies with large refining capacity.

Warren L. Baker



Don't throw in the sponge!

● We're the first to admit that it is no easy job to specify and buy the thousands of products needed to maintain operations for a modern pipe line system. But before you throw in the sponge and retire to that South Sea island, call "Oilwell."

We've been living with procurement problems such as yours for 92 years. Skilled specialists are available who spend all their time working with men like you. Completely stocked warehouses are strategically located so that you can get the item you want direct from our stocks—in a hurry.

Why not call "Oilwell" the next time you have a problem?

Complete warehouse system—Well-stocked warehouses are conveniently located to serve the important pipe line centers. Inquiries are given prompt attention and deliveries are made quickly to meet your emergency requirements.

Lower inventory investments—You can cut your own warehouse stocks to a minimum, reduce obsolescence and get a wider selection of materials, sizes and brand names from "Oilwell's" complete inventories.

Experienced personnel—"Oilwell" pipe line specialists have been trained to understand your material and service problems and can give you the service you require.

Quality products—"Oilwell" stocks include the best known brand names in equipment and materials, designed and approved for pipe line operations. When it comes from "Oilwell," you know it will meet your specifications.

92 years of experience—From almost the beginning of the petroleum industry, "Oilwell" has worked with the men engaged in drilling and production. Our goal is to extend the same prompt, dependable and complete service to those responsible for Pipe Line operations.

These famous products are sold by "Oilwell"

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and many others

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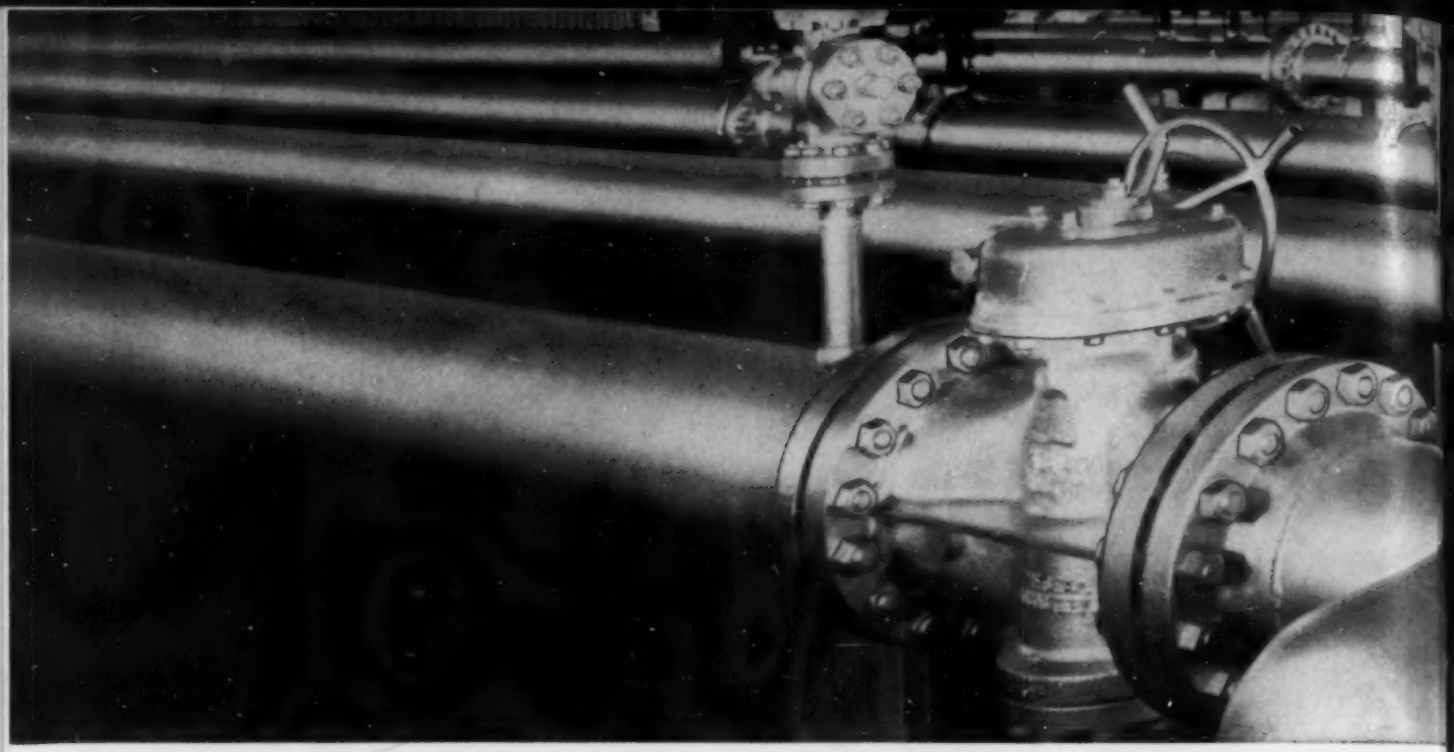
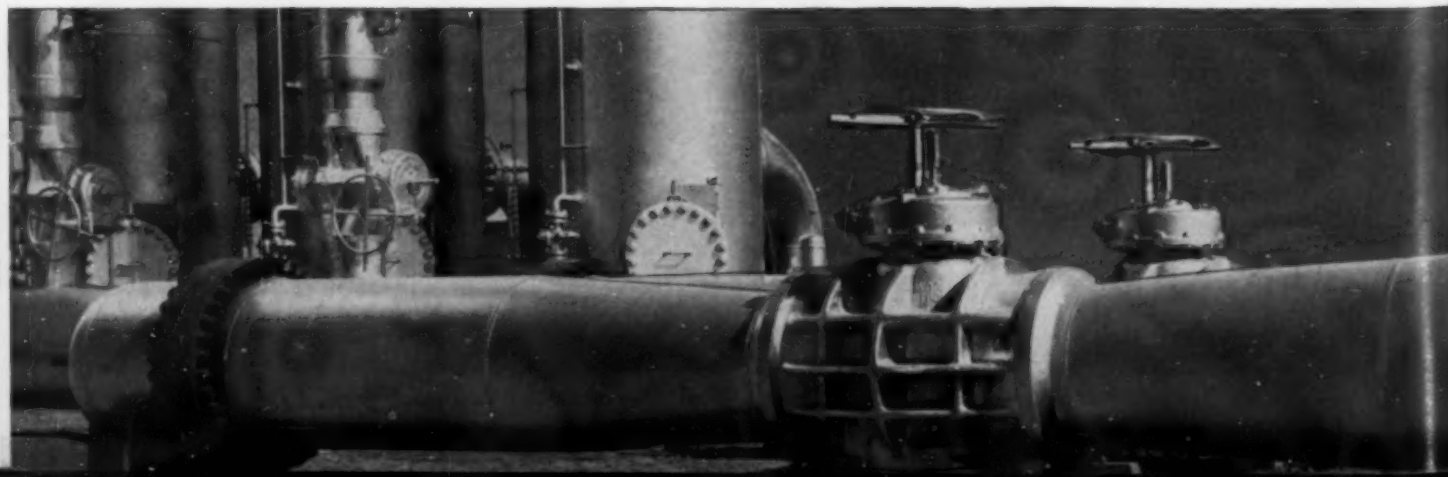
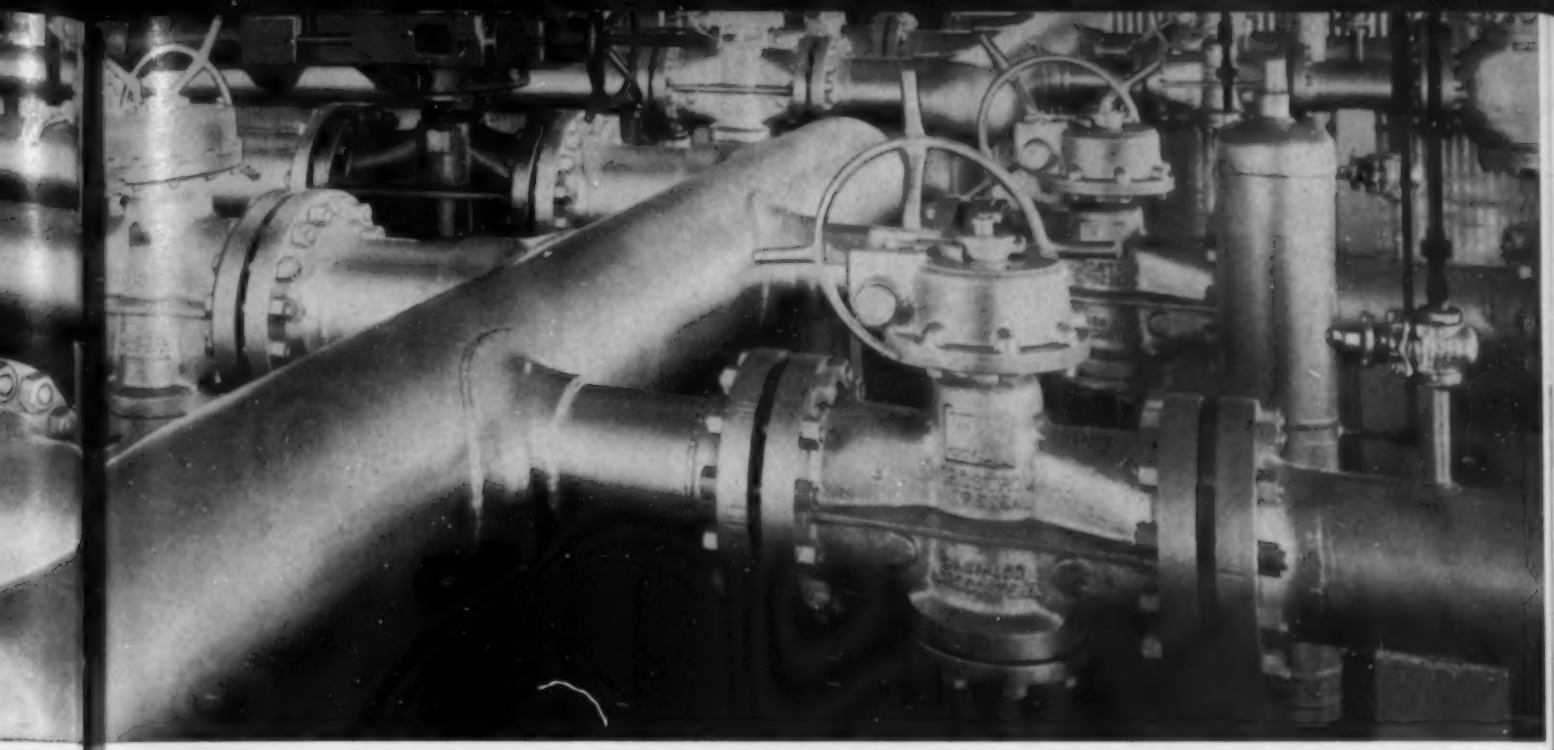


On ANY Gas Line
Rockwell-Nordstrom Valves
Assure Leakproof Control
At Lower Cost





From the gas field through the pipe line and the distribution system, Rockwell-Nordstrom valves will give you better, longer service at lower cost than any other valve you've ever used. The reason is *pressure lubrication.*

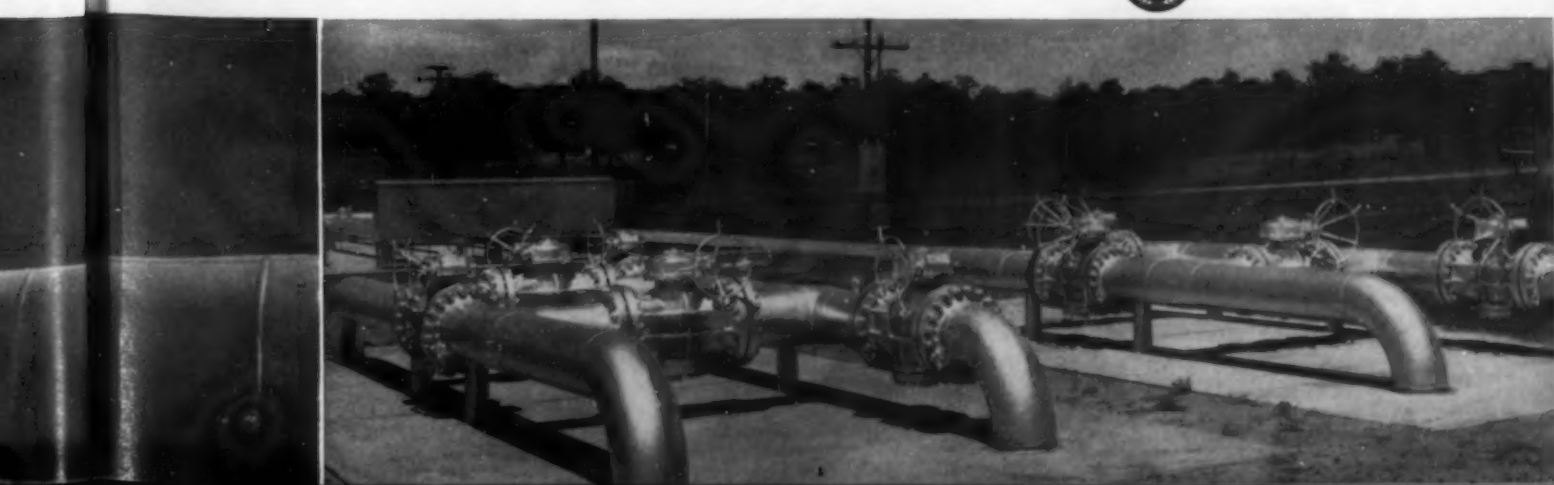
The film of lubricant between the tapered plug and the body forms a positive, leakproof seal that you can't get with the metal-to-metal closure in non-lubricated valves. The Rockwell-Nordstrom lubrication system is *continuous* . . . whether the valve is operated every hour or every month, the lubricant is *always at work* assuring leakproof sealing, and lubricating the plug for instant, one-quarter turn operation.

If you're considering automation . . . remote power operation . . . Nordstroms are your best bet because of the smooth, positive control made possible by one-quarter turn operation.

Rockwell-Nordstrom valves are the product of forty years of lubricated plug valve leadership. A *complete* range of sizes and pressure-temperature ratings makes it easy to standardize on *the original* lubricated plug valve. Write for complete information today: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee: Peacock Brothers Limited*

ROCKWELL-
Nordstrom **VALVES**

LUBRICANT SEALED FOR POSITIVE SHUT-OFF



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YOUR PIPE TO THE DITCH

Quality and service has been building sales for Spi. And Spi service does not stop when your pipe is loaded for shipment.

Many customers have placed confidence in the experience of our service men, who are available to assist your inspectors in your construction. Write for complete information.

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PIPE LINE INDUSTRY

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PIPE LINE INDUSTRY for the oil and gas pipe line industry.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

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Single copies 50 cents (except special issues). Double price for single copies more than a year old. Subscription price: domestic and foreign $2 a year; 2 years, $3; 3 years, $4. Subscription restricted to those engaged in the pipe line branch of the oil and gas industry, or the manufacturing and distribution of pipe line equipment.

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TUBE-TURN 42" Elbow

Installing a TUBE-TURN odd angle elbow

TUBE-TURN 36" Tees

TUBE-TURN®

Installing new TUBE-TURN Full-Encirclement Saddle for a "hot tap".

PIPE LINE FITTINGS and FLANGES

available from stock!

Elbows...45°, 90° and odd angles with tangents. *Tees* . . . straight and reducing outlet with or without scraper bars. *Venturi reducers* . . . *Full encirclement saddles* for hot tap . . . Every type and size of fitting and flange for pipe line requirements are available from Tube Turns . . . most of the items *from stock!*

"TT" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE-TURN Welding Fittings and Flanges are made in U.S.A. They meet all U. S. piping code specifications

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A Division of National Cylinder Gas Company

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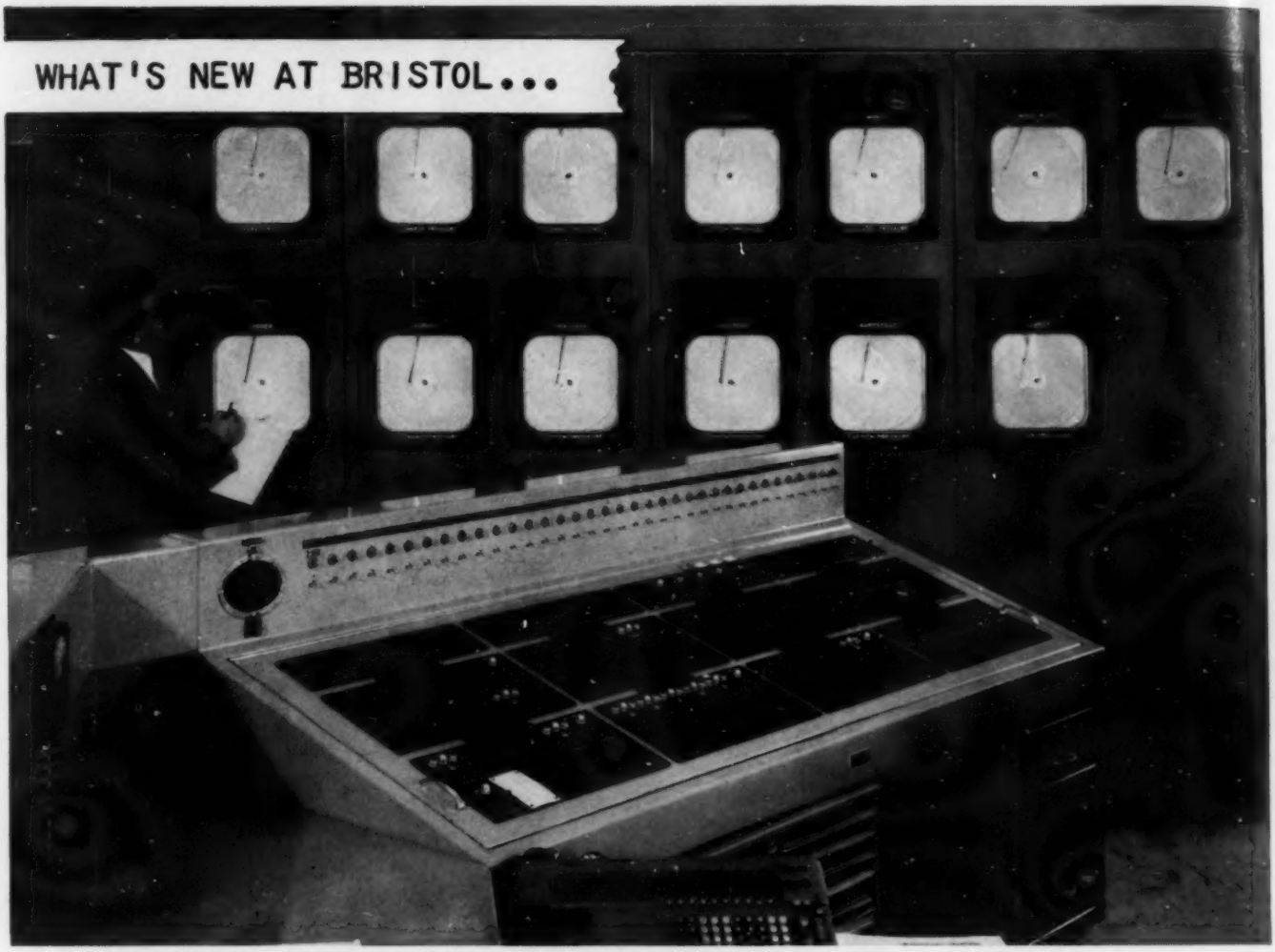

BRISTOL METAMETER* TELEMETERS in the Kansas City office of the Platte Pipe Line Company continuously record suction and discharge pressure, flow, and static pressure all along Platte's 192,500 b/d crude oil pipeline. Operations in the 1000-mile network of pipe are controlled from this central dispatching office — a situation made possible by continuous measurement at critical points.

*Reg. U.S. Pat. Off.

Taking the pulse of a 1000-mile pipeline

FROM THE ROCKIES to St. Louis, crude oil is monitored every foot of the way by Bristol instruments.

Why did Platte select Bristol Metameter Telemeters for their 1000-mile pipeline? Simply because it's good business to do business with Bristol — acknowledged leader in telemetering for over 43 years. Drop us a line today for the whole Bristol story. Write The Bristol Company, 114 Bristol Road, Waterbury, Conn.

4.40

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

PIPE LINE PROGRESS

26-inch A. O. Smith line pipe on location during Interprovincial's 1954 looping program.

Interprovincial's third looping project uses 386 miles of A. O. Smith line pipe

A. O. Smith supplied 386 miles of pipe to Interprovincial Pipe Line Company for its 1954 looping program. This total includes 190 miles of 24 inch pipe and 196 miles of 26 inch pipe. Our shipments, each on schedule, started in May and the loop was completed in October.

On the job from the start, A. O. Smith has served Interprovincial in three key phases of line construction. We supplied all the 20-in. and 18-in. pipe used in the company's original line from Edmonton, Alberta, to Superior, Wisconsin. The 20-in. main links Edmonton and Regina . . . while the 18-in. line completes the run from Gretna, Manitoba, to Superior. Total here was 864 miles of line pipe.

The second looping project brought another call for A. O. Smith line pipe — 135 miles of 24-in. pipe to loop the Saskatchewan and Manitoba sections in the system.

A. O. Smith is proud to have participated in the building of this great transcontinental system — the world's longest crude line — now transmitting western Canadian crudes all the way from Edmonton to Sarnia, Ontario. This participation demonstrates our ability to meet delivery schedules anywhere on the continent. Both our Milwaukee and Houston mills served to supply Interprovincial with high quality, internally expanded, welded line pipe.

A. O. Smith line pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

Through research ...a better way

A.O.Smith

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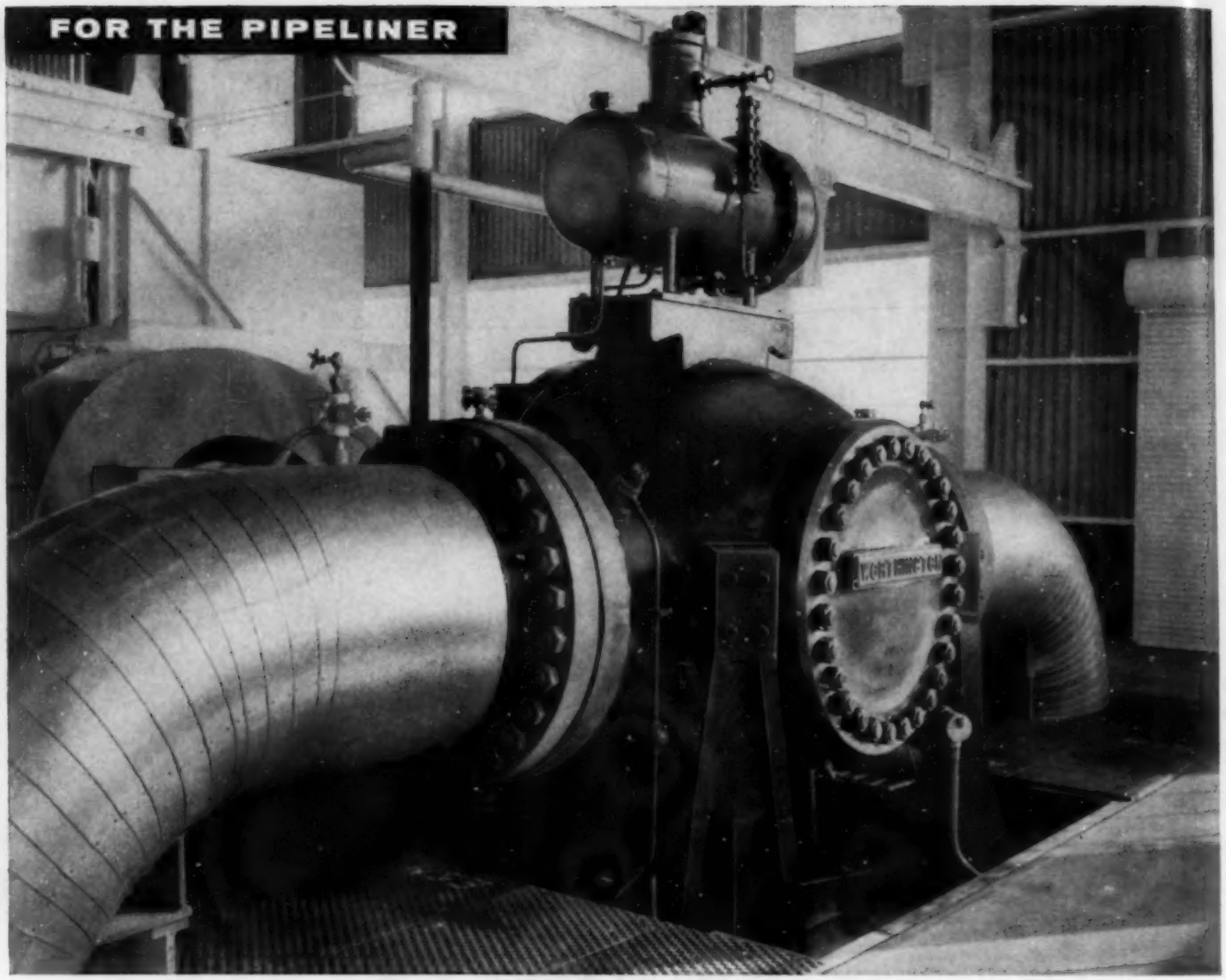

WORTHINGTON GUP CENTRIFUGAL COMPRESSOR installed in Northern National Gas Company's Compressor Station at Macksville, Kansas.

New design concept combats shaft distortion, seal-oil leakage in new centrifugal compressor

New design features give Worthington's new GUP a headstart on other compressors for gas transmission pipeline service.

The GUP's main casing and support design minimize shaft centerline distortions arising from high pressure in the casing. Compressor casing is basically spherical with heavy pedestals providing centerline support. Shaft barrel support is carried on rear casing cover with no other external restraint.

Spherical casing design provides a cavity behind the impeller as a safeguard against accidental seal-oil leakage into gas stream. Seal design itself has had extensive service on this type of compressor.

Among other features is an integral lubrication and seal-oil system that's independent of the driver lubrication system. An emergency oil tank supplies the seal and lubricates the bearings in the event of pump failure. No internal bearing mishap can result in starving another bearing.

Result: a reliable single-stage, heavy-duty machine designed for the full range of gas transmission pipeline service. For details, request bulletin C1100B57, Worthington Corporation, Section EK.4.4, Harrison, New Jersey. EK.4.4

WORTHINGTON

Economical, Continuous Power — Diesel, Dual-Fuel and Spark-Ignition Engines, from 200 to 5000 bhp.

The CLEVELAND "240"

digs 'em all, from 20"-36" wide, down to 6' 3" deep

The Cleveland "240" Trencher is a combination of practical, performance-proved features—from its big power plant right down to its rooter tips. Perfectly balanced at the exact center of its non-packing crawlers, 100% equipped with anti-friction bearings, it negotiates the wettest rights of way, overcomes the toughest hills.

With big depth capacity and rugged 3 bucket tooth pattern, the "240" fits all jobs, long or short, down to 6' 3" deep and up to 3' wide . . . pipeline projects . . . irrigation jobs . . . drainage work . . . water and sewer lines . . . conduit and cable work . . . any job where there's trench to be dug.

By its superior digging performance for owners the "240" has proved its ability to dig *more trench—in more places—at less cost,* has earned its proud position in the famous Cleveland *quality* line of trenchers that are *Good* Everywhere.

- More than 30 Usable Digging Speed Combinations from ½ f/m to over 37 f/m.
- 70 H.P., 469 cu. in. Diesel Engine.
- Clog-proof Crawlers, 100% Anti-Friction Bearing Mounted.
- Crawler Kick-out Clutch Increases Production, Adds Life.
- 3" Front Upper Truck Shaft Carries Wheel, Conserves Power, Saves Wear.
- Shiftable Conveyor, 30" Wide x 8' (or 10' 9"), 600 f/m speed.
- 15 Buckets, Patented Design, 3 Bucket Tooth Pattern.

Get the full story on this CLEVELAND from your local distributor or write for "240" Bulletin S-119 and Full Line Bulletin S-120.

THE CLEVELAND TRENCHER CO. • 20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

CLEVELAND

YOUNGSTOWN LINE PIPE ... LONGER LENGTHS, LESS HANDLING

● Youngstown Electric Weld Line Pipe averages 45 feet or more in length up to a maximum of 54 feet. Longer lengths mean fewer pieces to handle in loading, unloading and welding. Fewer joints per mile speed up installation, cut costs, the reason that many in the pipe line industry prefer Youngstown.

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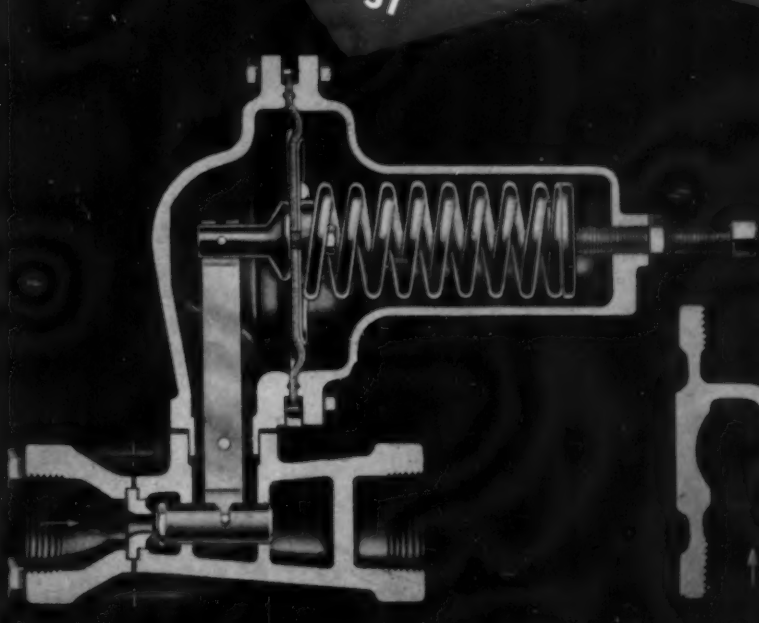
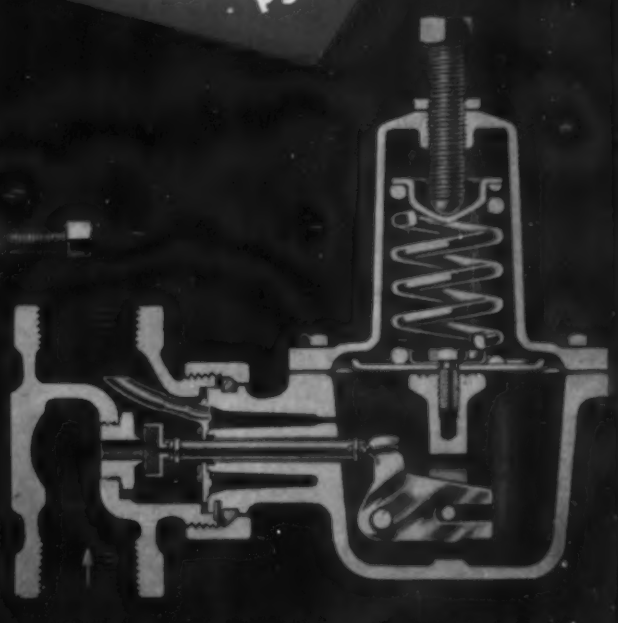
TYPE **630** FOR INLET PRESSURES UP TO **1500** PSI

TYPE **620** FOR INLET PRESSURES UP TO **750** PSI





Fisher's famous Big Joe Type 630 is the *best regulator* the industry has for rugged high pressure jobs. It's ideal for Farm Taps, Small Border Stations, and Industrial Installations, and is backed by *thousands* upon *thousands* of installations along the major pipelines of this country. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Available in 1" and 2" sizes for inlet pressures up to 1500 psi and outlet pressures 5 psi to 200 psi.

For *real economy* the Fisher Type 620 pounds to pounds regulator is especially designed for first stage reduction of gas pressure for farm taps on high pressure transmission systems.

For inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (5 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

Sizes: ¾", 1" and 1¼" with cast iron or cast steel body. ¾" and 1" with malleable iron body.

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LEADS THE INDUSTRY IN RESEARCH FOR BETTER GAS PRESSURE CONTROL

At last!

A TRUE VINYL MASTIC!

Complete protection in a single coat—10 mils thick.

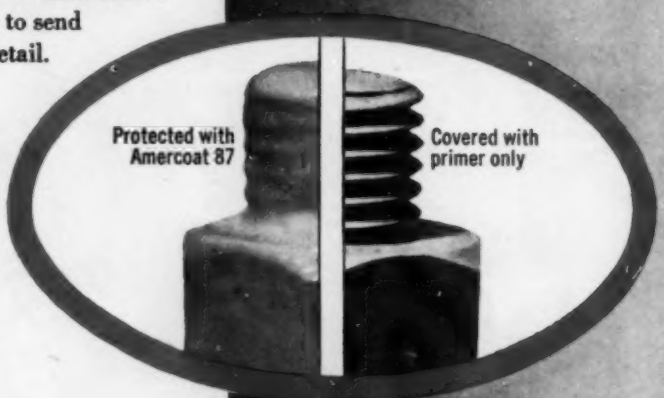
Amercoat No. 87 will cut your maintenance costs because one coat gives you the thickness and protection previously available only through the application of multiple coats.

Amercoat No. 87 is the brand new solution to an old problem, for it combines the time-tested chemical and weather resistance of a vinyl with the extra thickness that was heretofore available only in conventional mastics.

Amercoat No. 87 is easily applied with standard industrial spray equipment. Only one cross-spray coat, over a primed surface, is required for complete protection. Because **Amercoat No. 87** is a true vinyl, it is not limited to black, but is available in a variety of colors.

You can save up to 50% of your labor costs with **Amercoat's new vinyl mastic No. 87.** We will be pleased to send you a bulletin describing this new coating in detail.

Notice that the sharp bolt threads, welds and sharp corners are completely protected with one coat of Amercoat No. 87—10 mils thick!



Amercoat CORPORATION
Dept. ID
4809 Firestone Blvd.,
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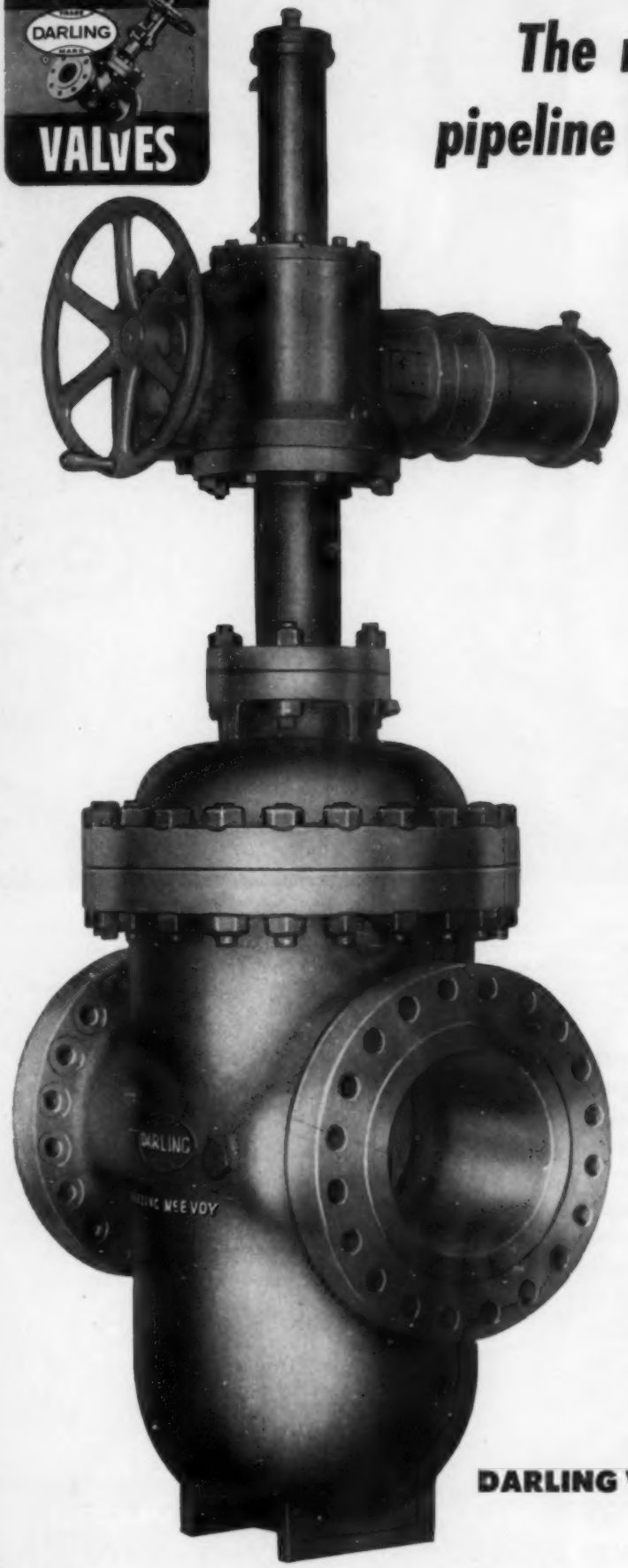
EVANSTON, ILL. • KENILWORTH, N.J. • JACKSONVILLE, FLA. • HOUSTON, TEX.

DARLING VALVES

The most important pipeline valve development in years

TRADE DARLING MARK McEvoy



New self-sealing two-way conduit valve for pipeline service automatically injects sealant by means of existing line pressure

Here's a new type of conduit gate valve, available in 8-inch and larger sizes, that gives positive downstream closure without dependence on metal-to-metal contact. Each time the valve closes, the required amount of sealant is applied automatically.

How it works

Employing the time-tested McEvoy principle, two cylinders, filled with special sealant, are located within the valve. Both are operated by line pressure. Depending on the direction of flow, line pressure actuates one or the other of these cylinders to force sealant into a channel in the downstream face of the seat. Since these cylinders hold enough sealant for 50 or more closures, the valves need only periodic servicing for recharging with sealant.

Write for details

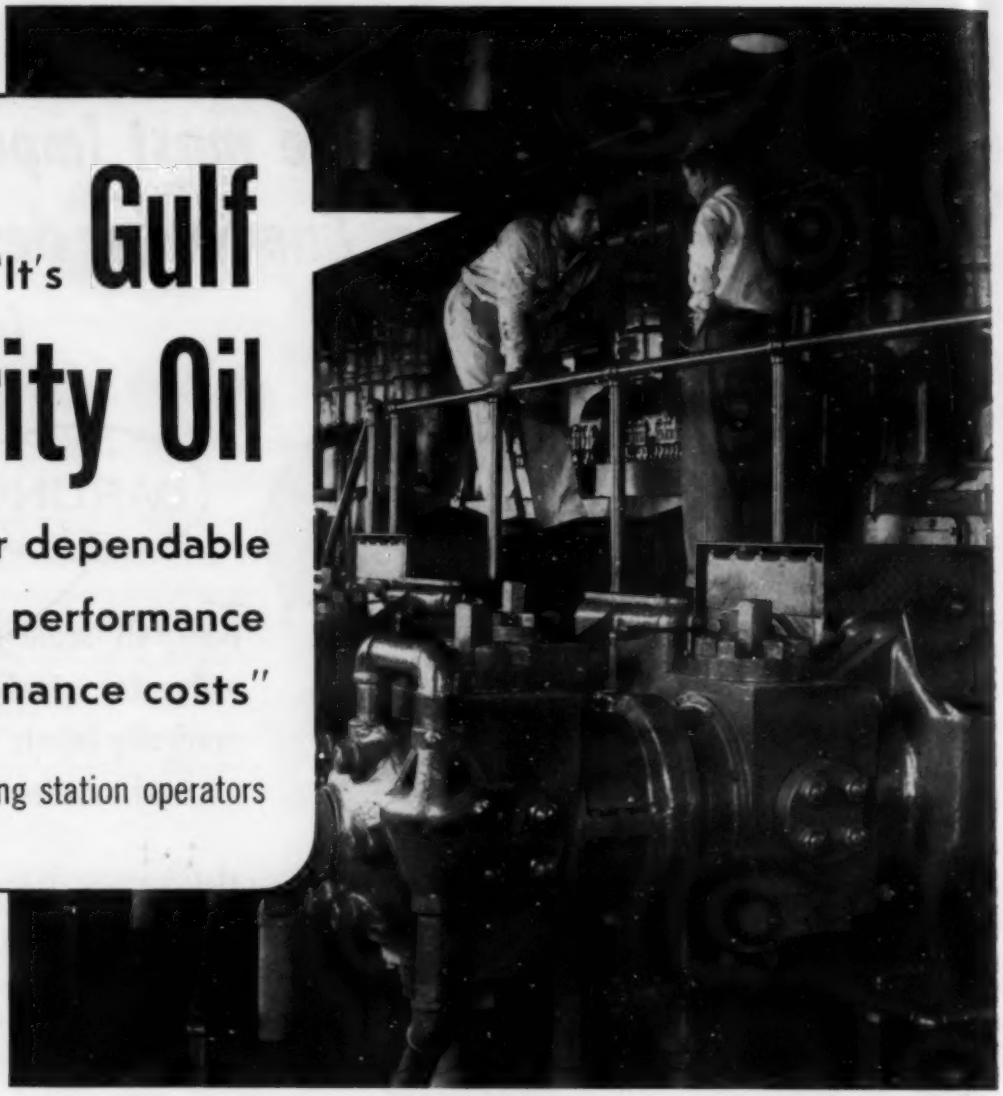
Ask for bulletin #5402 which contains complete information on the design and operation of this valve.

DARLING VALVE & MANUFACTURING CO.
Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

For more data on advertised products, use Readers' Service Cards, last page.

"It's Gulf
Security Oil
for dependable
gas compressor performance
and low maintenance costs"
say pumping station operators



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

You can depend on Gulf Security Oil to provide the proper lubrication that is so important to vital compressor units if operating troubles are to be prevented and maintenance costs kept low.

Gulf Security Oil has a record of outstanding performance in scores of gas transmission plants. After years of operation with this quality oil, the cylinders and piston rings of both the compressors and power assemblies show negligible wear. And few carbon deposits have formed on power cylinder ports and pistons.

If you are installing new compressor units, or feel that you're not getting the most effective lubrication possible for your present units, it will certainly pay you to try Gulf Security Oil. Contact your nearest Gulf Office and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company
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GULF

The finest petroleum products for your every need

new 1955 catalog

WELDOLETS
THREDOLETS
SOCKET WELDOLETS

. . . illustrating when and where to use them. Specific areas of application shown, also correct installation procedure and featuring these new developments:

1 Reduced inventory—size consolidation for interchangeability. **2** Thredolet rating addition—3000# and 6000#. **3** Complete range of stainless, alloy and non-ferrous materials. **4** Curvatures for additional pipe sizes through 36" and for caps, heads and flat surfaces. **5** New marking standard. **6** Weldolet Split Tees for complete encirclement reinforcement.

The new 1955 Bonney catalog will be mailed to you promptly upon request.

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MODEL MV (Special)
CUSTOM BUILT DROP FRAME VAN

MODEL ALV
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MODEL FVLA
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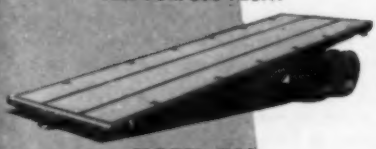
LIGHTEST WEIGHT GRAIN TRAILER

MODEL TBF
ALL PURPOSE FLOAT

MODEL THF
HEAVY CENTER-FRAME ALL PURPOSE FLOAT



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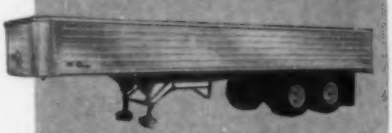
STANDARD OIL FIELD FLOAT—50,000 LBS.

MODEL TBF-C
STURDY LIVESTOCK TRAILER

MODEL TOP
PIPE AND POLES

MODEL FVL
LIGHTWEIGHT—ALL STEEL

MODEL OVL
LIGHTWEIGHT—OPEN—TOP ALL STEEL



MODEL OVLA
LIGHTEST WEIGHT ALUMINUM OPEN TOP

MODEL MV
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MODEL TOF-H
HEAVIEST-DUTY OIL FIELD FLOAT 80,000 & 100,000 LBS.

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DIVISION OF **LUFKIN FOUNDRY & MACHINE CO.**

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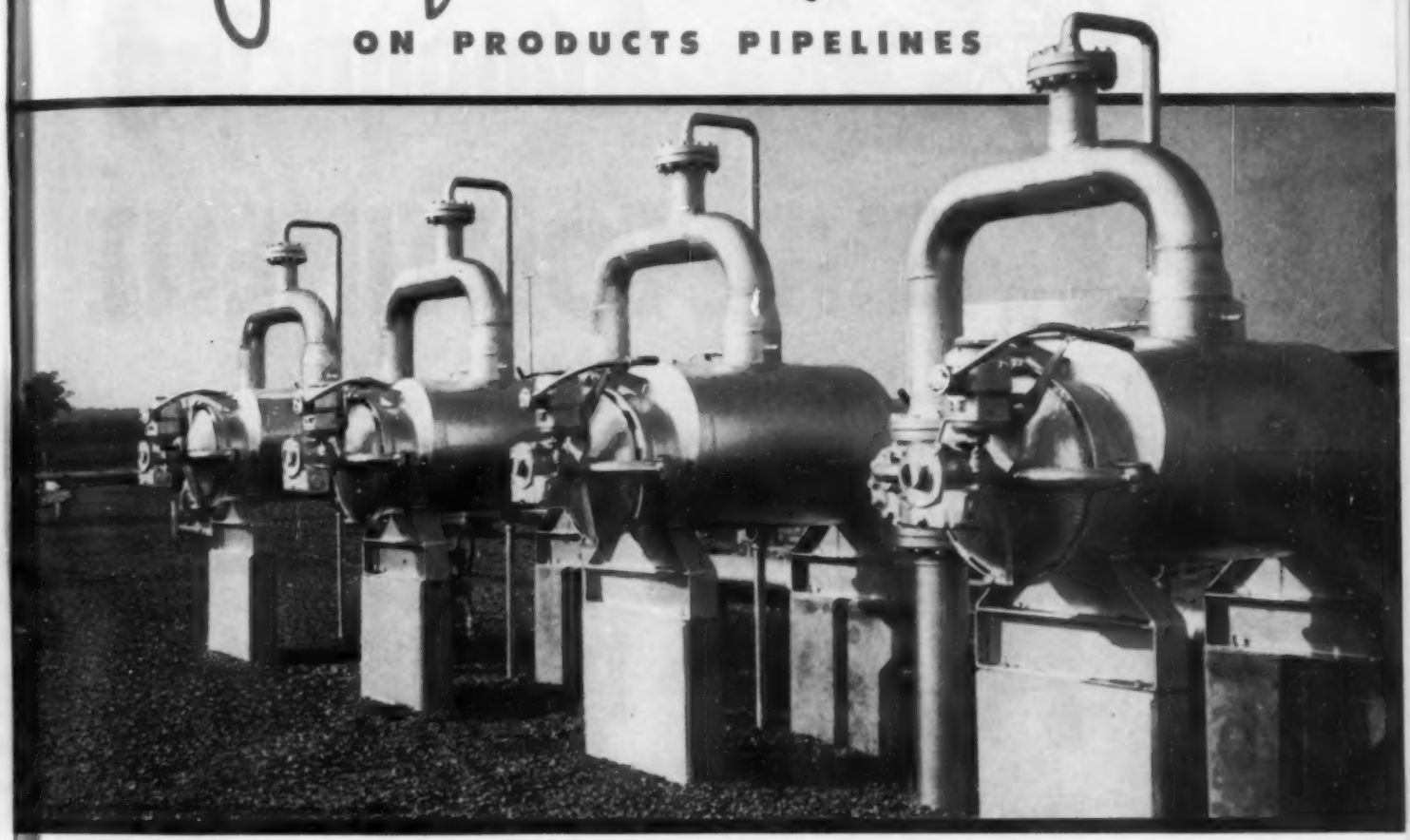
Good filtering is good business

ON PRODUCTS PIPELINES



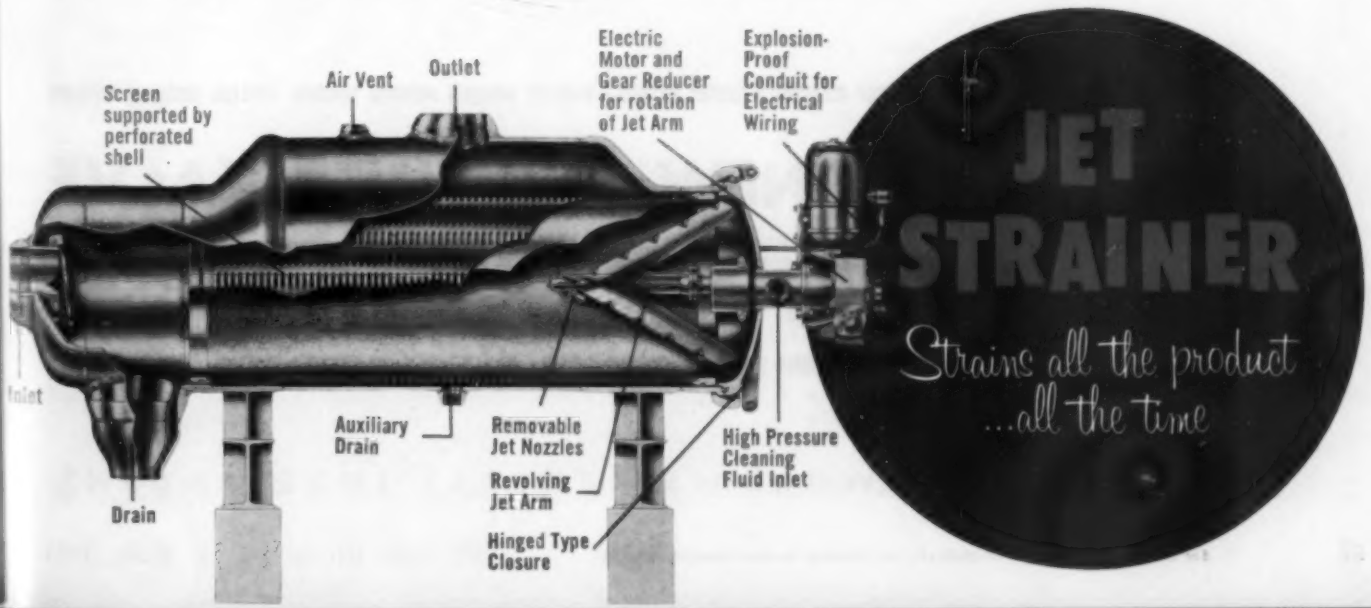
Only those strainers that filter *all* of the product . . . *all the time* . . . can protect pumping and metering equipment against wear, and control sediment in products. It is difficult to justify the cost of strainers that blind readily when the stream is loaded with solids and water and which cannot be cleaned rapidly enough to avoid bypassing or shutting down the pipeline.

Jet Type Strainers may be cleaned and returned to service in from 3 to 5 minutes by simply pressing a button on a control panel. Usually, a single operator can manage the entire strainer installation, or the *Jet Strainers may be made fully automatic if desired.* Consequently, Jet Strainers can be depended upon to "strain all the product . . . all the time." No bypassing, intentional or accidental. No slowing down or stopping the line to permit cleaning of strainers.

Per square foot of screen area, Jet Strainers cost little, if any, more than ordinary sock strainers. And the protection they provide for the entire pipeline system, plus low maintenance, are continuing extra benefits.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

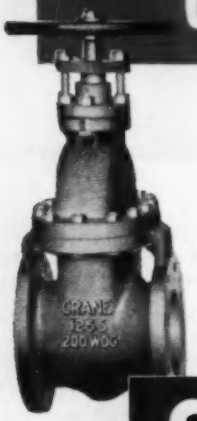


Announcing

of MID-CONTINENT

as distributors of

CRANE PRODUCTS



CRANE

For 100 years, since 1855, Crane Co. products have built their reputation for exceptional value. Mid-Continent is proud to offer our customers famous CRANE VALVES in a wide range of sizes in iron, steel and brass.

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the Appointment

SUPPLY COMPANY

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Their reputation for "eliminating valve problems before they begin" has made Rockwell Manufacturing Company's Nordstrom Valves famous throughout the oil industry. The many advantages offered by ROCKWELL Nordstorm VALVES mean finer valve service for Mid-Continent customers.

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Supply Company
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PESA
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OIL FIELD SUPPLY COMPANY

For more data on advertised products, use Readers' Service Cards, last page.

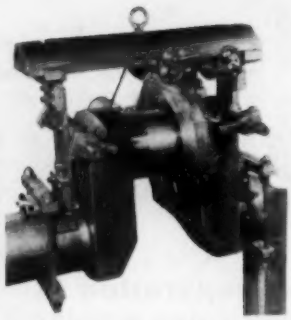
KINZBACH

ON THE SPOT MACHINING

Saves Time and Money

Kinzbach Portable Boring Bar

Kinzbach Crank Pin Turning Machine



A skilled Kinzbach service crew will save you money by doing turning, boring and other operations on your engines and compressors without dismantling major assemblies. The Kinzbach Tool Co. has developed special equipment to handle many pipeline, process plant and refinery repairs and has had many years of experience in this type of work.

The Crank Pin Turning Machine may be mounted on the crank shaft within the engine, thus turning the crank pin without removing the shaft from the assembly. The machine will turn from 8″ to 12″ crank pins.

The Kinzbach Portable Boring Bar will handle bore diameters from 7″ to 32″ and lengths up to 48″. This machine bolts directly into the cylinder as illustrated.

If your maintenance job falls within these ranges, it's often less expensive to have these operations done by a Kinzbach crew right at your site, rather than dismantling and shipping the machine into the shop. Special adaptations of this equipment are regularly made to fit the needs of a wide variety of special and unusual jobs. Call or write the Kinzbach Tool Company for complete information about this money-saving service.

KINZBACH TOOL CO INC

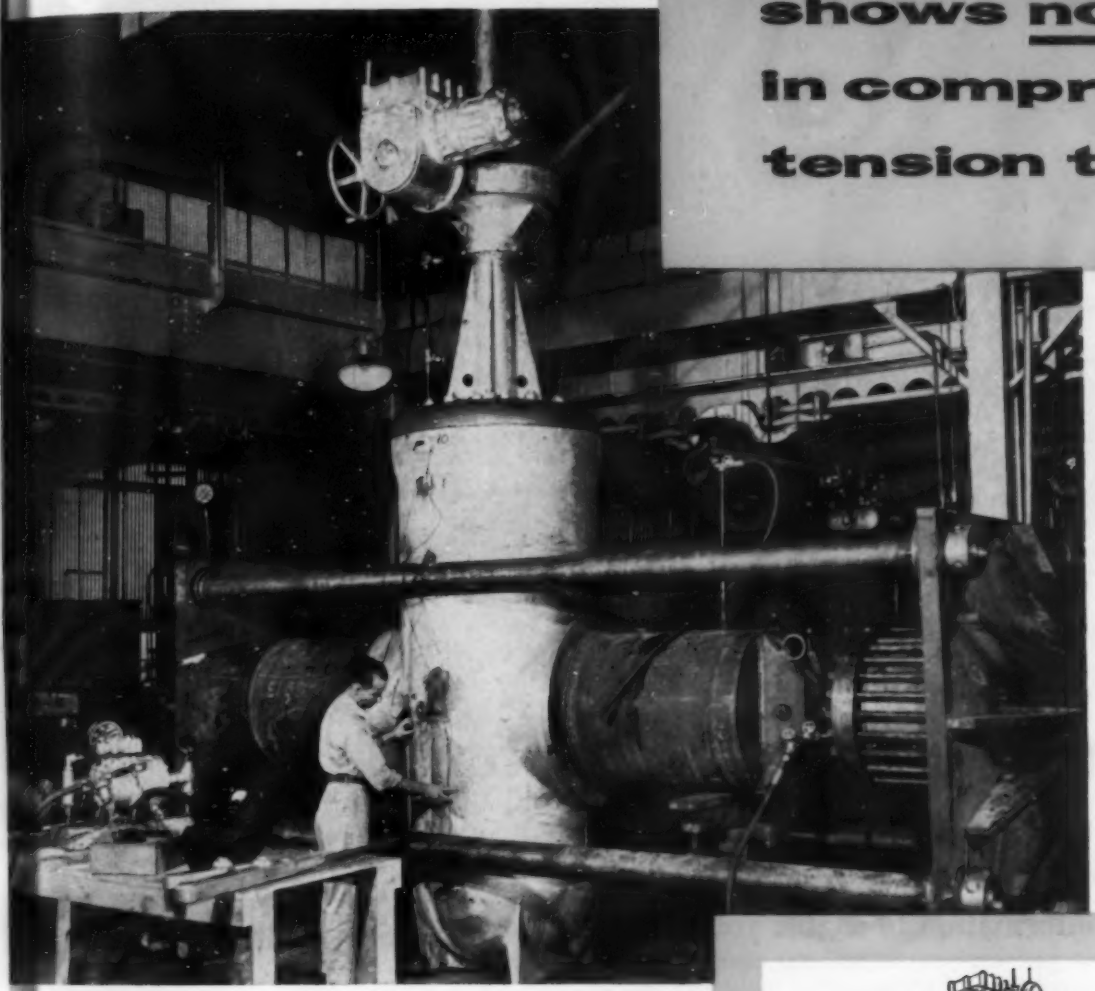
KINZBACH TOOL CO., INC.
P. O. Box 277
Houston, Texas

WHO'S MEETING WHERE

APRIL	
3– 8	API Safety and Fire Protection Committees, Jung Hotel, New Orleans.
5– 7	Corrosion Control Short Course, University of Oklahoma, Norman.
12–15	American Gas Association Distribution, Motor Vehicles and Corrosion Conference, Netherland Plaza, Cincinnati.
13–15	National Petroleum Association, Cleveland Hotel, Cleveland.
13–15	Natural Gasoline Association of America, Baker and Adolphus Hotels, Dallas.
18–19	AGA Residential Gas Section, Eastern Natural Gas Regional Sales Conference, Hotel William Penn, Pittsburgh.
18–20	American Society of Mechanical Engineers, Lord Baltimore Hotel, Baltimore.
19–20	Pacific Coast Gas Association, Distribution Conference, Phoenix.
19–20	Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.
19–22	Corrosion Short Course, Vancouver Section, National Association of Corrosion Engineers, University of British Columbia, Vancouver, B. C.
20–22	Indiana Gas Association Annual Meeting, French Lick Springs Hotel, French Lick, Ind.
20–22	Petroleum Industry Electrical Association and Petroleum Electric Supply Association, Joint Conference and Exhibit Show, Shamrock Hotel, Houston.
25–27	American Gas Association, National Conference of Gas and Electric Utility Accountants, Conrad Hilton Hotel, Chicago.
27–29	AGA Research and Utilization Conference, Hotel Statler, Cleveland.
MAY	
1– 4	Liquefied Petroleum Gas Association, Conrad Hilton Hotel, Chicago.
2– 3	Pacific Coast Gas Association, Transmission Conference, Palm Springs, Calif.
2–13	British Industries Fair, London and Birmingham, England.
5– 6	Corrosion Short Course, Shreveport Section, National Association of Corrosion Engineers, Centenary College, Shreveport.
9–10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
11–12	Pacific Coast Gas Association, Gas Supply and Transmission and Conference of Technical Session, Palm Springs, Calif.
16–18	American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Edgewater Beach Hotel, Chicago.
16–18	Southern Gas Association, New Orleans.
17–19	Pennsylvania Gas Association, Pocono Manor, Penn.
30–	Chemical Institute of Canada, Quebec City, Que.
JUNE	
1– 3	Annual Short Course in Gas Technology, Texas College of Arts and Industries, Kingsville, Texas.
5– 9	Canadian Gas Association, Annual Meeting, Sheraton Brock, Niagara Falls, Ont.
6– 9	American Society of Mechanical Engineers, Oil and Gas Power Division, Hotel Statler, Wash.
6–15	Fourth World Petroleum Congress, Rome, Italy.
7–10	American Welding Society, Municipal Auditorium, Kansas City.
9–10	Natural Gas and Petroleum Association of Canada, Royal Connaught, Hamilton, Ont.
11–15	Petroleum Equipment Suppliers Assn., Banff Springs Hotel, Banff, Alberta.
13–17	American Society of Civil Engineers, Committee on Pipelines, St. Louis.
20–23	American Society of Mechanical Engineers, Semi-Annual Meeting, Hotel Statler, Boston.
23–26	Rocky Mountain Oil Show, Casper, Wyo.

For more data on advertised products, use Readers' Service Cards, last page.

W-K-M Valve shows no leak in compression-tension tests



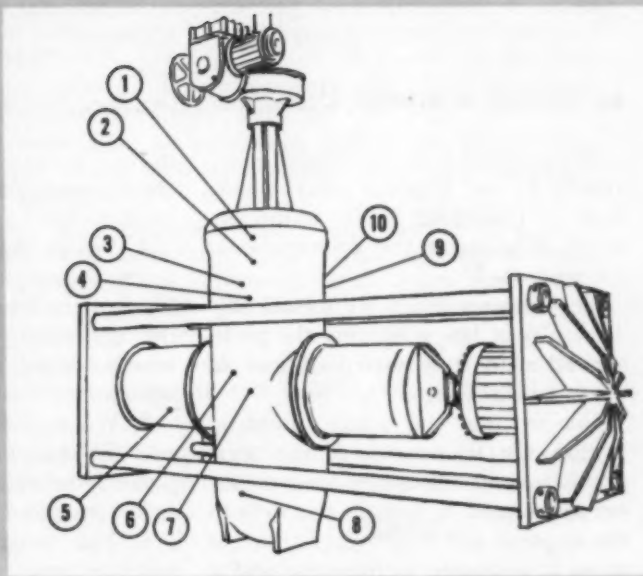
A special test was made in the W-K-M plant to determine what effect external compression and tension loads would have on seal-off and operation of a W-K-M Valve.

This test was conducted using a 30" ASA 400 p.s.i. weld-end gate valve operated by an electric motor. Ten strain gages were placed in the valve at locations shown on the diagram at right.

Using a hydraulic cylinder, an external differential tension load of 675 tons was applied to the valve while maintaining maximum working pressure against the gate.

During the tests the recorded strain-gage readings indicated no fibre stresses in excess of code allowables, indicating no appreciable body distortion. The valve did not leak and operated freely under all conditions.

W-K-M Pipeline Valves have been tested and proved in the laboratory and out on the line for more than thirty years. They offer the world's finest valve performance. Ask a W-K-M sales engineer to demonstrate a scale model valve.



The above sketch shows the placement of the strain gages used in the test.

W-K-M Valves

W-K-M Manufacturing Company, Inc.
A subsidiary of A.C.F. Industries Incorporated
P. O. Box 2117, Houston 1, Texas
Los Angeles, California
Export Office: 45 Rockefeller Plaza, New York, N. Y.

Who Owns Employe Inventions?

A good company program should tell who patents a device and who owns it. Here is basic information to enable you to sidestep some expensive pitfalls.

By ARTHUR N. BISHOP, Dresser Industries, Inc., Dallas

WHO SHOULD patent a device invented by an employe on company time and working with company tools? Who owns the device—he or his company?

The statutes don't say specifically. The rules of law governing the problem all stem from interpretations of the patent statute.

Nor is this the whole problem. Within the framework of the legal provisions must be constructed a patent assignment agreement fair to both the employe and employer. Failure to do so is invitation to litigation and a deterioration in employe relations.

And, finally, there must be an invention-incentive program to stimulate diligence.

The law governing patent procedure for an employe invention has four phases:

1. Where the employe has not signed an agreement (or made one orally) to turn the invention over to the company, and the invention belongs to him;

2. Where the company has a right to use the employe's invention gratuitously, even though the employe owns the invention, and regardless of whether there is a patent assignment agreement;

3. Where the company is entitled to own the invention, irrespective of the presence or absence of an assignment agreement; and

4. The assignment itself, with its ramifications.

General Employes—The first category deals almost exclusively with "general" employes, that is, those not specifically "hired to invent." Thus, if research department personnel, design engineers, and the like are removed from mind, all other employes (for purposes of this discussion) are general employes. That includes everybody from office boy to president. If there is no agreement to assign his invention to the company, a general employe owns it exclusively. This is true regardless of whether the invention is along the line of the company's machinery or products. Hence, if a junior accountant invented a new type of machine which would make an existing company machine obsolete, he could obtain a patent on it in his own name, retain full title to it, and market it wherever he chose. The courts have held that one who is employed as an expert does not necessarily mean that he was hired to invent, and, therefore, he is a general employe, too.

Supervisors and company officials are, in like vein, general employes who can defeat the company's right to an invention unless they have executed assignment agreements. The mere fact of their status does not preclude them

from title to their inventions unless there is a fiduciary duty along with the job. In all the cases which were examined in the research, those involving such fiduciary duty were well isolated and few in number.

This inviolate right of a general employe to his own invention carries with it serious consequences if the company appropriates the invention without paying a fair price for it. A part-time stevedore collected $40,000 for just such a thing a few years ago.

Shop Rights—Actually, a shop right amounts to nothing more than an employer's right to use an employe's invention in the company's business without having to pay him for doing so. The shop right lasts as long as the patent, or as the needs of the business justify, and the fact that the employe's connection with the company is severed after the invention has been perfected has no bearing on the matter. The shop right arises when the employe-inventor uses company time, materials, or labor, or merely acquiesces in the company's use of the invention. The right is automatic when the employe was hired to invent. By definition it is a

About the Author

ARTHUR N. BISHOP, financial analyst for Dresser Industries, Inc., in Dallas, previously was associated with Shell Pipe Line Company in Houston and with the Terminal Railroad Association of St. Louis in positions which have given him several years experience in accounting, finance and contracts. Since his graduation from the University of Miami (Florida) in 1947, Bishop has completed a master's degree in business administration at the University of Houston and received a law degree from Southern Methodist University. In addition to this article, his writings include a college textbook on economics, two articles on the law, another on office management and several short stories.

Here is a sample patent agreement which any company could safely adopt.

Employe Patent Agreement

THIS AGREEMENT, made and entered into this_____day of _____, 19____, between_____ Company, a corporation incorporated under the laws of the State of _____, hereinafter termed COMPANY, and_____, a resident of the State of_____, hereinafter termed EMPLOYE, WITNESSETH:

1. Consideration and Commencement: EMPLOYE, in consideration of his initial or continued employment by COMPANY, and the payment to him of wages, salary, bonus, royalty, and/or any and all other forms of remuneration, including gratuities, agrees to assign to COMPANY any and all letters patent obtained in his name as sole or joint inventor for inventions made or conceived during his employment, solely or jointly with others.

2. Coverage: this agreement shall extend only to those products, goods, and services which COMPANY manufactures, fabricates, makes, and/or furnishes for sale, and to the machinery, tools, devices, methods and/or processes utilized by COMPANY in such productivity, or which it is authorized to manufacture or furnish, at the time such invention by EMPLOYE is conceived. This agreement shall also include inventions or conceptions thereof by EMPLOYE outside of his normal working hours and/or outside COMPANY premises, so long as they otherwise fall within or relate to products, processes, and the like hereinbefore brought within the subject-matter of this agreement.

3. Exclusions: this agreement shall exclude all inventions conceived by EMPLOYE before the commencement or after the termination of his employment, whether or not such inventions be patented during such times he is not employed by COMPANY. Periods of layoff and/or furlough time of EMPLOYE, if involuntary, shall not be construed to be bona fide employment time for purposes of this agreement unless compensated by COMPANY. Those inventions on which letters patent have already been granted to or applied for by EMPLOYE are more fully set out at length, for purposes of clarity, on the reverse side of this agreement.

4. Expense of Patents Assigned: COMPANY agrees to pay all costs and expenses incident to the granting to EMPLOYE of letters patent for inventions conceived by him during employment and assigned to COMPANY. EMPLOYE agrees to execute all papers, applications, drawings, designs, and other incidentals necessary to the granting of such original, substitute, reissue, or renewal patents.

5. Shop Right: nothing in this agreement shall be construed to be a waiver by COMPANY of any shop right which it may possess at law in inventions by EMPLOYE.

6. Duration: this agreement shall terminate on the date when employment of EMPLOYE terminates, PROVIDED that any invention otherwise within the scope of this agreement which is conceived during employment but patented after its termination, shall, nevertheless, be within the terms of this agreement.

7. Succession: this agreement shall bind and inure to the benefit of COMPANY, its successors or assigns, and EMPLOYE, his heirs, executors, or administrators.

IN WITNESS WHEREOF the parties hereto have executed the above agreement and affixed their respective seals on the day and year first above written.

COMPANY

By: _____
President

Attest: _____
Secretary

EMPLOYE

Witnesses:

_____ _____ **Seal**

_____

gratuitous license, so no royalties attach. It is not assignable, but will pass to another company where there is a complete corporate succession.

Another feature of the shop right is that the employe cannot sue the company for infringement. Neither can an outsider to whom the employe has conveyed title to his patent by assigning it to him.

There are some limitations on the shop right, however. The first of these is the invention of a general employe perfected by such employe on his own time and at home, he never acquiescing to the employer's use of it. Second is when the employer has previously denied that the employe is the inventor. If this has happened and the employe is declared by the courts to be the inventor, the company cannot then change its position and try to assert a shop right. The third limitation is where the invention in question was actually perfected before its maker entered the company's employ, the employe then incorporating the pre-employment invention into another one made during employment. The three preceding impediments all presume that there is no assignment agreement between employe and employer.

The opposite is true in the fourth limitation: where there is an agreement, but the employer has asserted no rights under it and has rejected the invention as impractical, he cannot then reverse his field and try to assert a shop right.

Can the shop right be expanded into an implied assignment of the invention to the employer? Yes, where the employe-inventor has been hired to invent, and such is the modern trend of court decisions.

Employer's Title—The third broad grouping in the law of patent rights between company and employe is where the employer gets the full title to the invention whether there is an assignment agreement or not. The most obvious illustration of this is where the employer himself conceived the basic idea and hired the employe (or assigned him to the task) merely to work out the details. In such event, however, the employer must have conveyed fairly explicit instructions as to the perfection of the device. A concrete example of this is the hypothetical situation of an executive conceiving an idea for a radically new style device which he can even picture in his "mind's eye." He wishes to proceed immediately, so he designates a particular foreman to carry out the process, informing him how to do it. The foreman cannot then successfully claim the invention as his own.

Another way the company gains good title to employe inventions without the formality of an assignment is, as was seen above, where the shop right to an invention conceived by one hired to invent, ripens into an implied assignment. Here, however, the company must clearly show that the employe was actually hired to invent. This holds true, also, where the employe was originally hired as a general employe but has since been transferred into inventive work. If the proof is there, though, the company gets the invention, but it must do so before the inventor's employment terminates.

Past assignments by the employe to the employer may indicate a pattern of conduct which gives rise to the presumption that he is bound to do so as long as the employment continues, but this is not a conclusive presumption.

Assignment Agreements—Hence, the safest way out is the employer's "employe invention insurance policy"—the patent assignment agreement. This is the fourth and final consideration of the law.

Such agreements have been held by the courts not to lack consideration, and they are neither unconscionable, unreasonable, or against public policy. It follows that courts of equity will compel the employe to obey them, this being a proceeding known as specific performance. The idea is this, as the court would speak to the employe trying to evade the contract: "You executed the contract; the company has performed its part; now you perform yours."

The coverage of the agreement is broad, as the court decisions indicate. Not only is it retroactive to the employment date (thereby taking in inventions made in any interim period if the agreement is signed subsequent to employment), but it follows the employe's invention after his employment has terminated, providing it was conceived during employment. The company's title gained by the agreement is absolute. A further significance of the breadth of the agreement is that it covers secret inventions of the employe made on his own time, so long as they are related to the nature of the employer's business.

This breadth of coverage has its boundaries, though. One is that the agreement must be specific, that is, it cannot be limitless in time or in scope of subject matter. Thus, an agreement which specifies that "all inventions of machines made by the employe during his natural life shall belong to the company" will be struck down by the courts. So, too, will one calling for company title "to all inventions of whatever type." A natural resultant conclusion is the second limitation: the types of inventions recited in the contract must pertain to products or devices in the line of the company's business.

A third roadblock is that the agreement will never extend to inventions made by the employe prior to his employment date, whatever the nature of such inventions may be. A conclusion of logic may be drawn: the agreement should be carefully drafted, for the courts will construe it strictly against the employer.

Employes in Litigation—Before crossing the border which separates (1) the strictly legal points of company and employe invention rights from (2) a practical invention-incentive program, consider the classes of employes which have been involved in litigation involving the patent rights. Table 1 shows the types of positions which employes held in various companies in 139 cases studied.

Table 1 lends strong weight to the conclusion that all male employes should execute patent assignment agreements, plus all females engaged primarily in research work or employment where there is considerable confidential information imparted.

TABLE 1

TABULATION OF CLASSES OF EMPLOYES INVOLVED IN LITIGATION

Upper Management Levels		**Other Echelons (Cont'd.)**	
Director	1	Engineer, Chemical	1
President	7	Engineer, Consulting	2
Vice-President	2	Engineer, Experimental	1
Secretary-Treasurer	1	Engineer, Mechanical	4
General Manager	2	Engineer, Testing	1
Superintendent	15	Engineer (Unspecified)	2
Sales Manager	1	Foreman	3
Research Director	3	Inspector	1
Chief Engineer	4	Inventor	16
Asst. Superintendent	2	Laborer	3
Total	38	Machinist	6
		Mechanic	5
Other Echelons		Metallurgist	1
Cameraman	1	Research Staff	5
Chemist	9	Salesman	5
Designer	3	Toolmaker	1
Draftsman	4	Unspecified	26
Electrician	1	Total	101
		Grand Total	139

The Plan—Deciding on the classes of employes to include in a patent agreement program is not one of snap judgment, but it is certainly an individualized selection. A survey was made by the National Industrial Conference Board in 1952 among 48 large companies. The results of that survey were these: 43 had definite written agreements; all 43 required technical employes or those engaged in research, engineering, and the like to sign. Executives and supervisors were required to sign in 19 firms, and 11 stipulated that service and sales employes be included, also. One required production employes to enter into the agreements, and ten specified that all employes become parties to the agreements.

Since there is no "one best plan" suitable for all companies, no hard, fast rule can be laid down as to what categories of employes should be included. The safest thing, therefore, is to include all of them. However, women's comparative lack of mechanical abilities would preclude the necessity of having them in on the agreement unless the types of jobs they hold justify it: thus, the recommendation that only women in research work or positions of confidence —those likely to have access to inventive knowledge or plans—be included. It might be added that in all 139 cases investigated, only one involved a woman, and she was a mere pirate instead of the real inventor. She occupied a position of great confidence.

An Invention-Incentive Program—Common sense dictates that, even though the program is decided upon and the classes of employes selected, it will avail little practical success other than assuring the company's rights to employe's inventions, if it is entered into arbitrarily. Legally, all employes can be forced to sign them, but force is not always a practical method. There is a natural corollary to a patent assignment program—an invention-incentive plan. Any union objections to the assignment agreements should be dissolved if the employe is "offered something." This is only a modern application of the adage that one can catch more flies with honey than he can with vinegar.

What have other companies done in the field of invention-incentive? Many have done something, and some have done a great deal. The average of all the plans studied involves the payment to the employe of a cash award when he executes the patent application and a substantially larger sum when the patent is granted and he assigns it to the company. The company in all cases pays the patent expenses, so, naturally, a patent committee studies the idea after its disclosure to determine its patentability. If it possesses this attribute, a preliminary patent search is conducted by the company's attorneys before the application for patent is prepared. Manufacturing, legal, and personnel men are naturals for a company's patent committee.

Taking the best from all the plans studied, the one generally adaptable to most types of business should include policies along these lines:

- Establish a patent committee in each of the company's branches (if a multi-unit operational business; otherwise, in the main plant only) to review disclosures of ideas.

- If an idea reviewed appears patentable and the preliminary search by the company's attorneys is favorable, prepare the patent application.

- Pay the employe a nominal sum, say $25, upon signing of the patent application.

- Pay the employe a proportionately larger amount, say $75, when the patent is granted.

- Pay the employe royalties on a sliding scale for any increased savings or increased profits which accrue because of the company's use of the invention, and on a like scale if an outsider is licensed to use the invention. The payments should be made quarterly and on a percentage basis, such as:

  10 percent on the first $50,000

  5 percent on all above $50,000

- Establish an annual award of a specified amount, as $500 or more for the best invention during the year, etc.

A plan like this, coupled with an ironclad patent assignment agreement is one which will not only deter litigation and overcome employe objections, but will also spur efficiency by the incentive to invent. Two qualifications should be made, however: (1) directors, officers, and consultants should be excluded from the awards, although the first two categories are to execute patent assignment agreements; (2) those employes hired to invent should receive awards only in the amount of 50 percent of the above, since the supposition is that their salaries are proportioned to the nature of their work, and to give them the same award as a general employe would give with it an unfair advantage.

What the Contract Should Include—In welding the patent agreement to the incentive system, the contract should include these clauses:

1. Retroactivity to the date of employment.

2. Subject matter includes only the line of products which the company manufactures or the machines and processes it uses in making those products (look here to the company's charter).

3. A definite time limit should be set, and this should be the date of termination of the employment (with the proviso, however, that inventions conceived before employment shall, nevertheless, be assignd to the company).

4. Specific exclusion of inventions prior to employment.

5. The consideration of "employment" or "continued employment" alone is enough: no monetary amount needs to be stipulated—or paid—for the mere signing of the agreement.

Incorporation of the foregoing features amplifies some of the highlights of the cases studied and should profit any company by the bitter litigation lessons that others have learned, and avoid for it the pitfalls of the past.

Existing plans might be reviewed at this time, especially in the light of the new benefits granted to inventors by the 1954 income tax law.

In conclusion, it cannot be restated too strongly that a patent assignment agreement should be coupled with an invention-incentive program to assure efficiency of performance. One without the other is akin to a fisherman without bait. The results would probably be equally inglorious, particularly if the company omits using the "fishing pole" of the process—the advice of its attorney.

—The End

You Can Calculate Faster With These New Mathematical Charts

Answers can be read directly from one-page chart. The method is 50 percent faster than a slide rule and twice as fast as a calculating machine.

By E. J. GEORGE, Sun Oil Company, Aldan, Clifton Heights, Penn.

About the Author

EMMANUEL J. GEORGE, a designer of new mathematical charts has been associated with Sun Oil Company for 26 years. Since World War II, he has been a member of the company's Process Engineering division and since 1951, a member of the chemistry faculty at Drexel Institute of Technology. George holds both B.S. and M.S. degrees from the University of Pennsylvania. He is author of a number of articles contributed to journals and to Perry's Handbook.

George, who joined the Sun organization shortly after he left college, is a member of the American Chemical Society. He lives in Aldan, Pa., a suburb of Philadelphia, is active in church work and considers travel as his principal hobby.

Two NEW mathematical charts provide a convenient, economical tool that can be used for the same purpose as a slide rule or calculating machine.

The charts consist of a log scale superimposed diagonally upon a log-log grid. The Multiphase Mathematical chart, Figure 1, includes scales for multiplication and division as well as those for obtaining directly the square root, cube root, and logarithm of a number. Another chart, the Multiplication and Division chart, has the same pattern, but without the log, square and cube root curves. Both charts contain examples illustrating the various mathematical operations which can be performed.

The standard charts, each used independently, have the same accuracy as a seven and one-half inch slide rule. Values are read directly without the use of a straight edge as required with a nomograph. An added feature of these charts, in contrast to slide rule manipulation, is that the operator has a free hand to record values instantly as they are read. This factor, coupled with the elimination of time-consuming scale settings, account for the record speed with which calculations are made using these charts. Comparative runs have shown the chart calculations to be fifty percent faster than those made with a slide rule, and twice as rapid as a calculating machine.

These charts were devised to meet the need for a convenient, accurate, and very inexpensive calculator. Their acceptance in leading colleges and universities throughout the country has been rapid. Aside from their convenience and simplicity, the charts increase the fundamental understanding of logarithms—thereby easing the path to slide rule operations.

However, since their introduction last fall, these charts have already found a host of additional applications. Engineers report that the charts are useful for field calculations, because they can be inserted in the back of notebooks for ready reference. For administrative personnel, the charts can be placed under the glass desk top where they are ready for instant computation during phone conversations (when only one hand is free) as well as for the numerous mathematical problems that arise during the day—thereby saving appreciable time consumed by other calculating methods. Similarly, these charts constitute a convenient conference room aid. In view of their wide utility and convenience in making calculations, it is very probable that these charts will soon take their place among the reference tables of technical texts and handbooks.

CHARTS AVAILABLE

Readers desiring these charts should address their inquiries to:

E. J. George
428 East Magnolia Avenue
Aldan, Delaware County, Pa.

These charts are available at a cost of 25 cents each.

Speed Up Your Calculations . . .

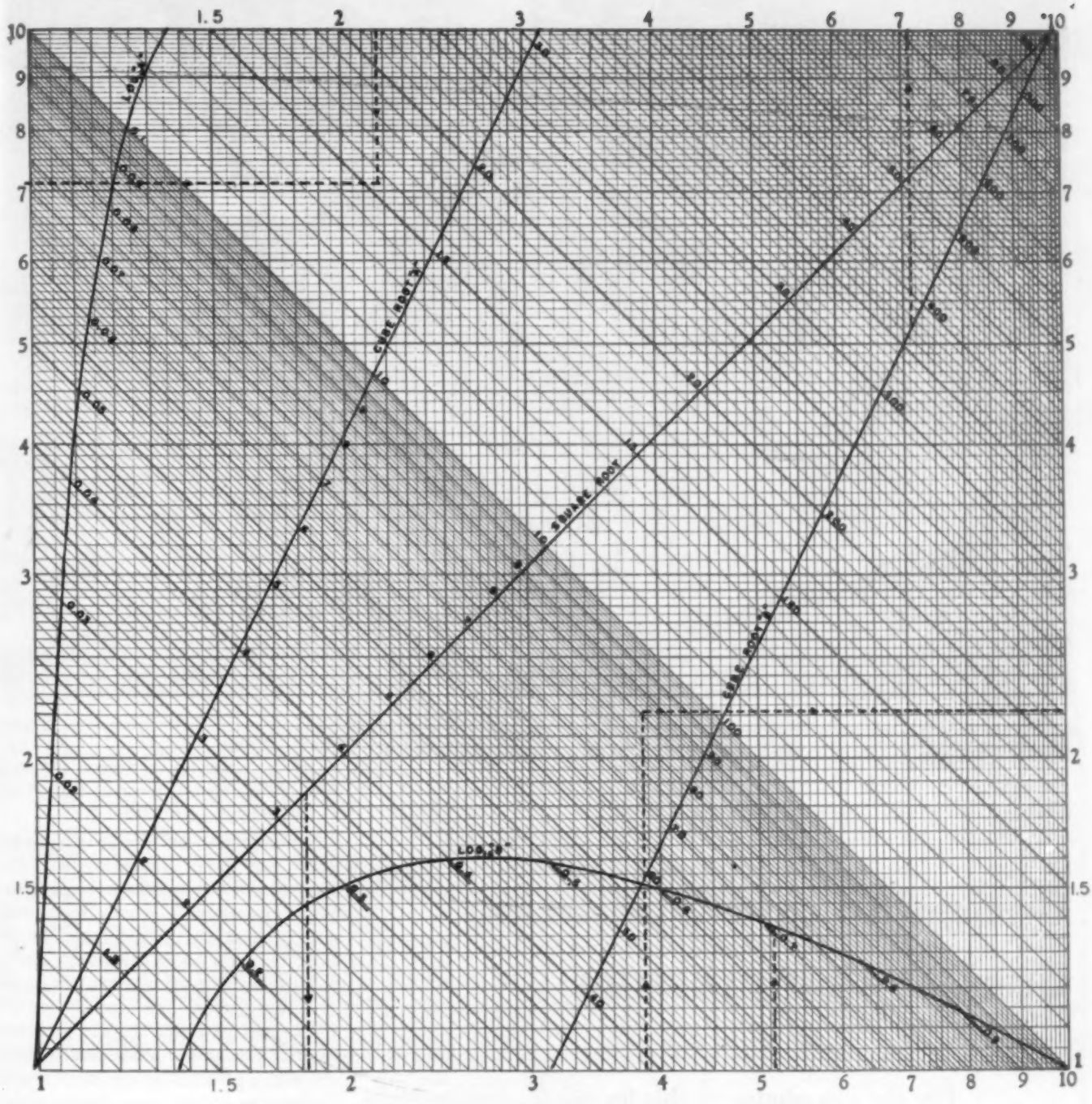


FIGURE 1. MULTIPHASE MATHEMATICAL CHART

Full explanation of this chart is contained in the article by Mr. George, its designer, on the preceding page. The examples below also will be of assistance in acquiring a working knowledge of "the convenient, economical tool that can be used for the same purpose as a slide rule or calculating machine."

EXAMPLES
(Adjust for Decimal Place)

1. Multiply 22 by 71 —From 2.2 top and 7.1 left, read 15.6 on diag. scale (Sq. Rt. curve). Answer, 1560.
2. Divide 86 by 39 —From 3.9 bottom to 8.6 on diag. scale (Sq. Rt. curve), read 2.21 on right. Answer, 2.21.
3. Square root of 339 —From 3.39 on diag. scale (Sq. Rt. curve), read 1.8 on bottom scale. Answer, 18.4.
4. Cube Root of 373 —From 3.73 on diag. scale (Cube Root "B" curve), read 7.2 on top scale. Answer, 7.2.
5. Logarithm of 52 —From 5.2 bottom scale, read 0.716 on diag. scale (Log "B" curve). Answer, 1.716.

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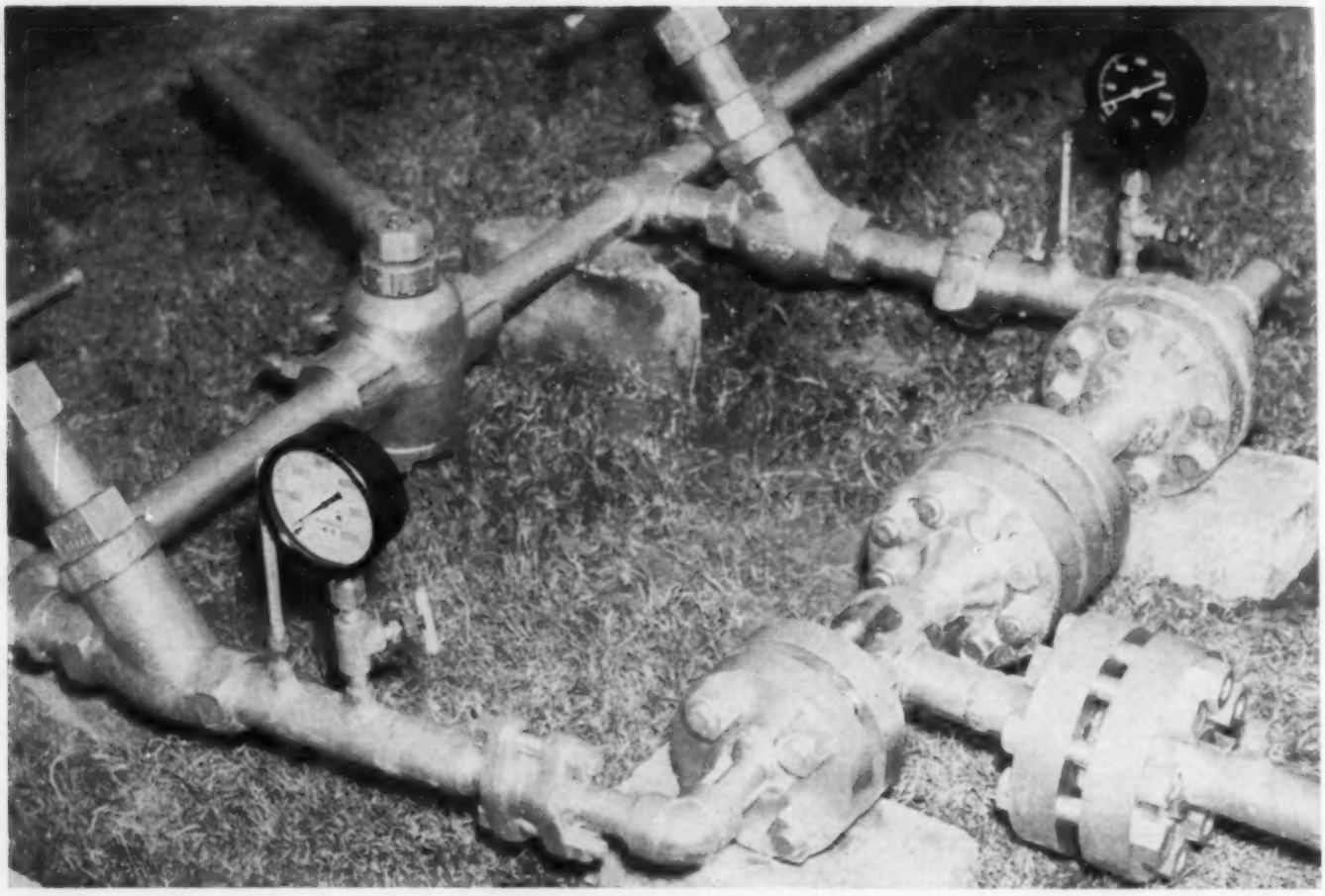


TYPICAL FIELD INSTALLATION of a gas jet compressor at lower right. High-pressure gas enters at lower left and compresses low-pressure gas entering from right. Discharge at upper right is into intermediate pressure system.

Designing and Operating Gas Jet Compressors

For the gas producer, this ingenious device offers a low-cost method of putting low-pressure gas into high-pressure lines.

By FRANK H. DOTTERWEICH and C. V. MOONEY
Division of Engineering, Texas College of Arts and Sciences, Kingsville, Texas

THE GAS JET compressor is a simple device with no moving parts which enables low-pressure gas to be entrained into a stream of high-pressure gas. It is a new application in the natural gas industry, yet it employs basic principles of gas entrainment practiced since the discovery of the Bunsen burner. In these jet entrainment operations, a gas under pressure is allowed to expand with a resulting increase in velocity and, as it passes through a restriction gas or fluid at a low pressure, is entrained. The velocity of the resulting mixture is reduced and the pressure increased to that above the gas entrained.

Development and use of this equipment has been increasing rapidly. This trend will continue because of many installations where high-pressure natural gas is available which must be reduced in pressure principally along delivery points in natural gas transmission line operations.

The uses to which the gas jet compressor is being put, to a great extent are where pressure of the motive and suction gas do not vary. Under these conditions, the gas jet may be designed, built and placed in satisfactory operation. There is a great opportunity for the application of gas jet compressors in natural gas practices, especially on dually-completed gas wells where both high-pressure and low-pressure gas are available, and where there is an intermediate pipe line pressure. Although the gas jet compressor is relatively inexpensive, a large part of its costs is for engineering design work. Likewise, the gas jet compressors presently available must operate very close to design conditions since any change in operating pres-

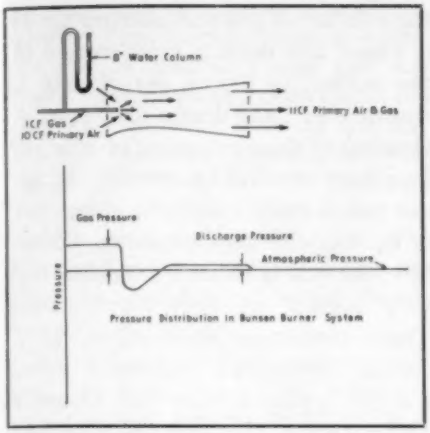


Fig. 1—Conditions of flow in a Bunsen burner demonstrate quite well the theory of a gas jet compressor.

sure seriously impairs its performance. Therefore, it appears that a gas jet compressor so designed to give flexible operating characteristics by adjustment in the field would do much to encourage the use of such equipment. The development of such a gas jet compressor to operate satisfactorily in the field would make additional quantities of low-pressure gas available with a large saving in the capital expenditure.

Applications. The gas jet compressor may be used in any number of applications where two gas streams (one at high-pressure, the other at low-pressure) are to be combined to form a gas mixture at some intermediate pressure. Warner[3] has discussed the design, performance and application of the gas jet in gas mixing. Fletcher[2] notes various gas jet applications including one in which high-pressure natural gas from a transmission line was used to boost manufactured gas to distribution line pressures. In this operation, a large utility company effected a great saving in capital expenditure by replacing obsolete motor-driven centrifugal compressors with gas jet compressors.

Theory. The theory of the gas jet compressor may be better explained by observing the conditions of flow existing in a low-pressure Bunsen-type burner system. Such a system is shown in Figure 1. One cubic foot of natural gas could entrain 10 cubic feet of air required for its complete combustion, provided the pressure at the orifice was about 8 inches of water pressure and orifice size and burner

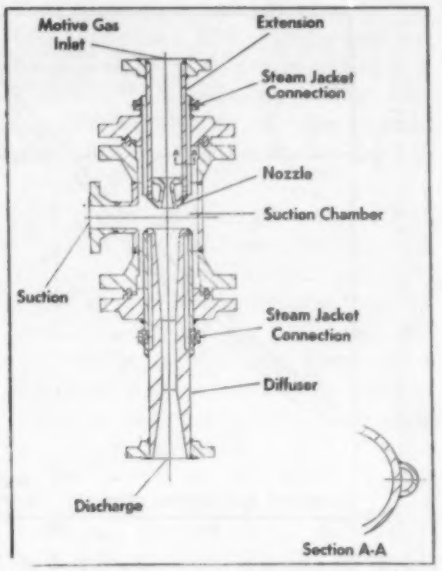


Fig. 2—Gas jet compressor shown in cross-section is relatively simple. It consists of four main parts: a suction chamber, a nozzle extension, a nozzle and a diffuser.

proportions were designed correctly.

In this case, the design was based on the assumption that for a given burner, the momentum (product of mass and velocity) of the gas as it leaves the orifice, bears a sufficiently constant ratio to the momentum of

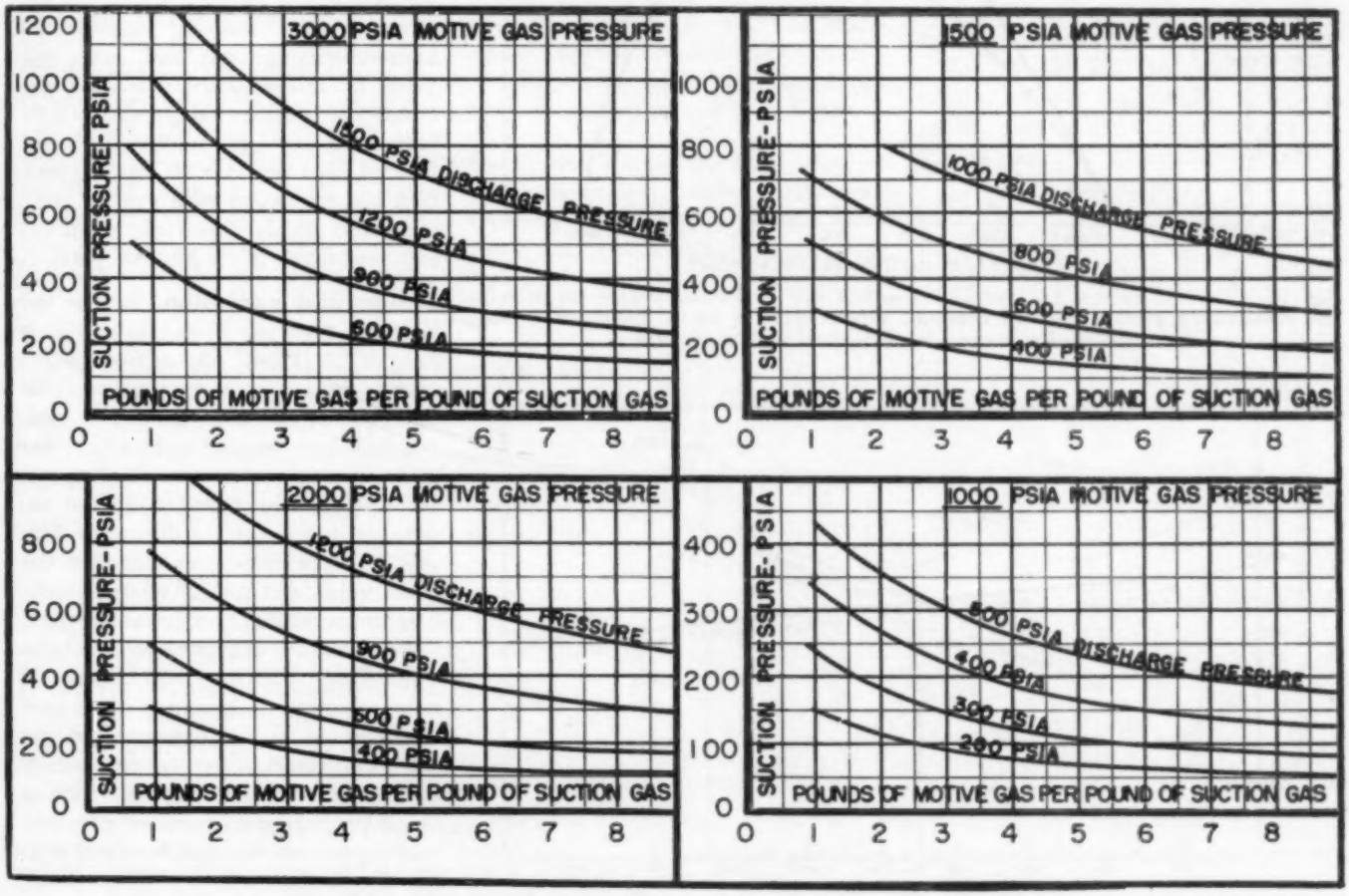


Fig. 3—Requirements of high-pressure motive gas to compress a gas of the same density to several discharge pressures shown above are qualitative and merely serve to indicate the possibility of a certain project. Data developed by Fletcher.[1]

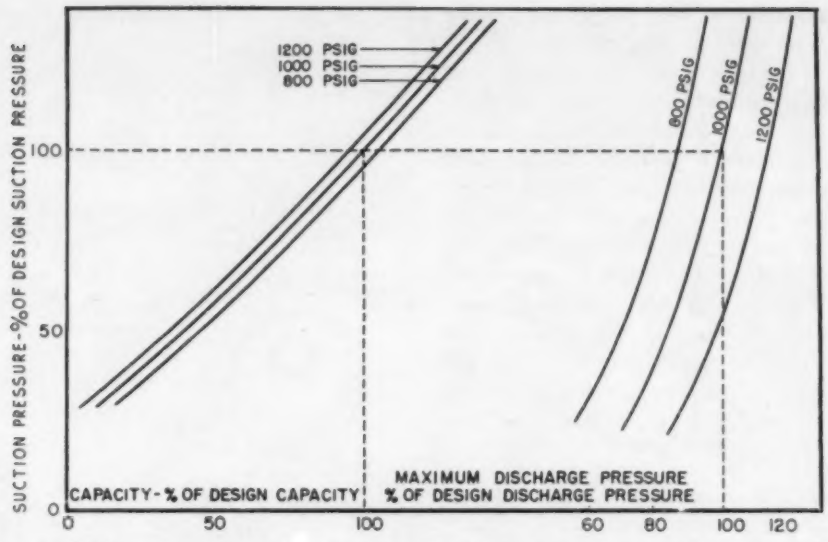


Fig. 4--Performance curves developed by Fletcher[1] show characteristics that may be expected in the operation of gas jet compressors.

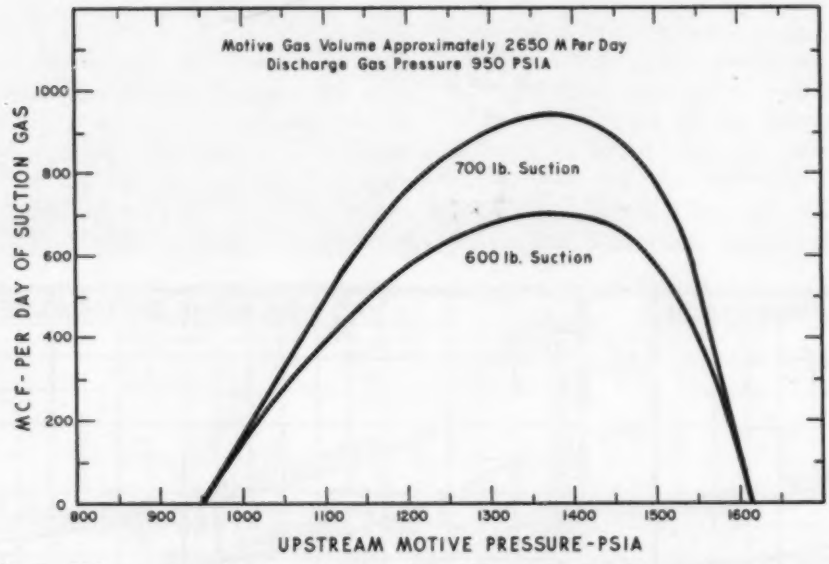


Fig. 5—Volume of suction gas compressed to 950 psia by varying motive gas pressure and maintaining suction pressure constant. Upper curve is for a 700-pound suction pressure; the lower curve for 600-pound suction pressure.

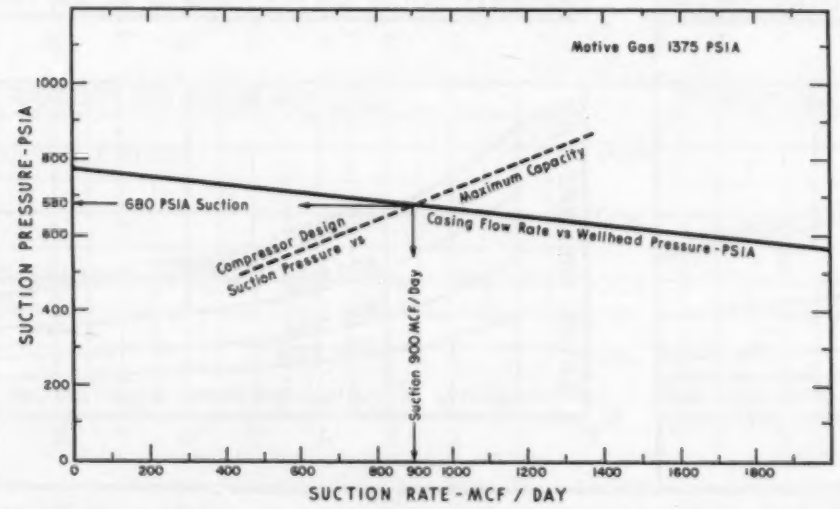


Fig. 6—Quantity of suction gas that can be compressed to 950 psia by varying the suction pressure and maintaining motive gas pressure constant at 1375 psia.

the mixture of gas and primary air as it passes any definite cross section of the burner, to permit use of such a constant in most design problems. A theoretical demonstration of this relationship involves assumptions which are not justified except by the result of the experiments themselves. Therefore, the rule is entirely empirical but very helpful in design operations. These theoretical assumptions, to a certain extent, are confirmed when the unit is placed under test. Figure 1 also indicates the pressure distribution throughout the system from the motive pressurized natural gas, the suction air and the discharge mixture above the normal atmospheric pressure.

In the so-called gas jet compressor shown in Figure 2, higher pressures and velocities are used. The high-pressure gas expands through a converging-diverging nozzle with an accompanying decrease in pressure and temperature and with little increase in entropy of the gas. As a result, velocities of 2000 to 3500 feet per second may be obtained. The entrainment properties of this high velocity jet pull low-pressure gas into the jet stream. The resulting mixture of high-velocity jet gas and large volumes of low-pressure entrained gas enters the diffuser where the kinetic energy of the gas mixture is transformed into pressure. It can be seen that the operation of a gas jet compressor is highly dependent upon design and finish of its internal parts.

Design and operation. In the design of gas jet compressors, it is helpful to know about how much high-pressure gas is required to compress gas of the same density to various discharge pressures. Fletcher[1] has given this subject of gas jet compressor design concentrated study and has developed the curves shown in Figure 3. These curves do not give the exact value, but merely serve to indicate the possibility of a certain project.

Performance curves have also been studied by Fletcher and Figure 4 notes characteristic curves that may be expected in the operation of gas jet compressors. One set of curves is obtained by holding the motive (high-pressure gas) pressure constant varying the suction gas flow and noting the suction pressure. From these data, the percent of design capacity versus the percent of design suction

pressure may be plotted. Should the motive and suction pressures be maintained constant, and the discharge line gradually closed with the discharge pressure building up, the jet will maintain constant suction pressure until a critical discharge pressure is reached. At this point, the suction pressure will increase. The discharge pressure at which this occurs has been defined[1] as the "maximum back pressure."

By determining this maximum back pressure at several suction pressures, a curve may be developed to show the relationship of maximum discharge pressure, and as percent of design suction pressure. These curves indicate that for a gas jet to perform as desired, the motive pressure must not fall below design pressure unless the discharge pressure is also lowered. Also, the discharge pressure should not be increased above the design pressure unless the motive pressure is increased.

Formulae that are helpful in the design of gas jet compressors have been developed and are noted in Appendix I, Section 1. Calculations for the design of a gas jet compressor to fit a certain field requirement is given in Appendix I, Section 2.

Efficiency low. These calculations indicate that the gas jet compressor has an over-all efficiency of about 20 percent. This low efficiency limits the number of conditions in which it can be used. An ideal situation for its use is where high-pressure gas is available that must be reduced in pressure before it can be transported or processed. This high pressure energy, heretofore dissipated and wasted, is available through a gas jet compressor to boost low-pressure gas to pipe line pressure. It is this application that has been studied in the laboratory and by field installation.

No servicing required. In the operation of a gas jet compressor, little or no servicing or maintenance is required for the inexpensive unit. However, it must be accessible for inspection.

Hydrate problem. As the high-pressure gas expands in the nozzle (Figure 2) with ensuing high velocity, low temperatures are encountered. The temperature attained at the tip of the nozzle may be so low that hydrate formation will result, and the build-up of solid particles may interfere with operation. This hydrate formation may be eliminated by heating the motive gas, which is an expensive and rather difficult procedure. Hydrate formation at the nozzle will interfere with jet operation only when it adheres to the nozzle. Therefore, should the nozzle be heated sufficiently to prevent the solids from adhering and building up, satisfactory operation can be assured. The nozzle and diffuser can be heated electrically or with small quantities of steam applied to jackets as noted in Figure 2.

Field studies. Studies on gas jet compressors were limited to theoretical calculations and a study of laboratory units until a gas jet compressor was made available for field study by the courtesy of James E. Pew of Sun Oil Company. This compressor has been used in a cooperative research program with engineers of The Chicago Corporation on dually-completed gas wells in the Stratton Field of Texas.

The jet compressor as received from the Sun Oil Company had been designed for operating conditions other than those encountered on the dually-completed gas well available for test in the Chicago Corporation production field. It was redesigned as noted in the appendix to conform to these new conditions.

The results of one series of tests are shown in Figures 5 and 6. It will be noted in Figure 8 that about 910,000 cubic feet of 700 pounds per square inch absolute gas was compressed to 950 psia gas by 2650 Mcf of 1375 psia motive gas. When the suction pressure on the well dropped to 600 psia, the same compressor with no alterations in nozzle or diffuser, compressed 700 Mcf of 600 psia gas with 2650 Mcf of 1350 psia motive gas. Figure 6 has been developed to show the quantity of suction gas that could be compressed to line pressure 950 psia as the suction gas pressure varied. The jet compressor in this field installation performed a duty which would call for conventional compression equipment requiring many times the amount of capital investment and operating expense.

REFERENCES

[1] Fletcher, George R., "Gas Jet Compressors," *Power and Fluids*, Fall 1954, page 12.

[2] Fletcher, George R., "Gas Jet Compressors," *Power and Fluids*, Fall 1953, page 10.

[3] Warner, C. W., "Gas Mixing with Jet Compressors," *Gas*, September, 1954, page 50.

APPENDIX 1—SECTION 1.
DEVELOPMENT OF FORMULA FOR THERMAL COMPRESSOR PERFORMANCE CALCULATIONS

I. Symbols:

- p — pressure, pounds per square inch absolute.
- T — absolute temperature, degrees Rankin.
- s — entropy, British thermal units per pound—degrees Rankin.
- C_p — specific heat at constant pressure, Btu/lb.—°R.
- k — ratio of specific heats, C_p/C_v.
- h — enthalpy, Btu/lb.
- v — velocity, feet per second.
- w — pounds suction fluid compressed per pound motive fluid.
- g — gravity, feet per second^2.
- J — mechanical equivalent of heat, 778 foot-pounds/Btu.

II. Assumptions:

- A. Flow is frictionless (viscosity of fluid is zero).
- B. Expansion in nozzle and compression in diffuser are isentropic.
- C. Motive fluid is the same as the suction fluid.
- D. Calculations are based on 1 lb. of motive fluid.
- E. Mixing occurs at constant pressure and is adiabatic.
- F. Total enthalpy of the mixture is the average of the total enthalpies of the components.
- G. Velocities at points 1, 3, and 5 (Fig. 7) are negligible

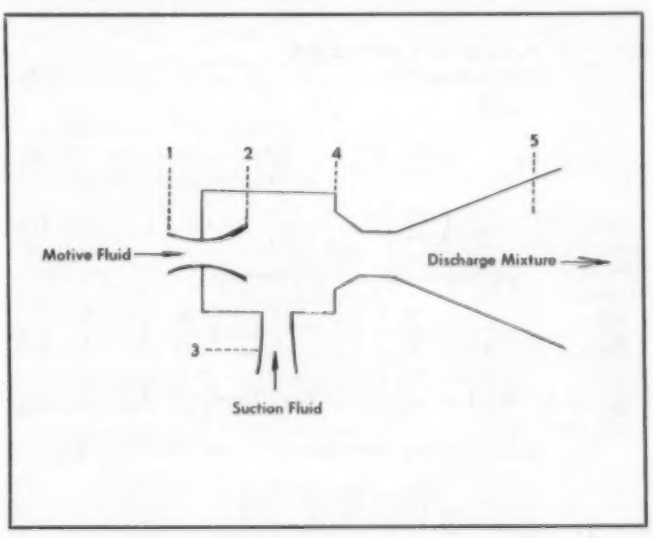


Fig. 7—Schematic drawing of gas jet compressor to identify determination points used in calculations.

compared to those at 2 and 4.

H. Pressure at 2, 3, and 4 are equal.

III. Methods of calculation:

A. Derivation of General Relations

1. According to assumption F,

$$(1+w)\,h_5 = h_1 + wh_3 = h_1 - h_2 + h_3\,(1+w)$$

$$h_3 = h_2 + \frac{h_1 - h_5}{1+w} \quad \ldots\ldots (1)$$

2. Applying assumptions A, B and G ($v_5 = 0$) to the equation expressing the conservation of energy for the diffuser yields,

$$h_4 = h_5 - \frac{v_4^2}{2gJ} \quad \ldots\ldots (2)$$

3. Applying assumption E to the equation for the conservation of momentum during the mixing process,

$$v_2 = (1+w)\,v_4 \quad \ldots\ldots (3)$$

Squaring both sides and dividing by 2gJ yields,

$$\frac{v_4^2}{2gJ} = \left(\frac{1}{(1+w)}\right)^2 \frac{v_2^2}{2gJ} \quad \ldots\ldots (4)$$

4. Applying assumptions A, B, and G ($v_1 = 0$) to the equation expressing the conservation of energy for the nozzle yields,

$$\frac{v_2^2}{2gJ} = h_1 - h_2 \quad \ldots\ldots (5)$$

5. Substituting equation (5) into (4) and the result into (2) gives

$$h_4 = h_5 - \frac{h_1 - h_2}{(1+w)^2} \quad \ldots\ldots (6)$$

B. Method of determining w as a function of p_5 if a Mollier, p-h, or other suitable state diagram is available for the gas or vapor.

1. Knowing h_1, h_5, and w, calculate h_3 from equation (1).
2. Calculate h_4 from equation (6).
3. From a Mollier chart, locate state at point 4 knowing h_4 and p_4.
4. Locate h_5 along isentropic from 4 (s = constant) yielding p_5.
5. Repeat steps 1-4 for different values of w.
6. From calculations of steps 1-5, plot curve of w vs. p_5 or w vs. p_5/p_4.

C. Determination of w as a function of p_5 based on perfect gas relations.

1. Derivation of Equation.

a. From equation (4),

$$(1+w)^2 = \frac{\frac{v_2^2}{2gJ}}{\frac{v_4^2}{2gJ}}$$

b. Since for a perfect gas,

$$\Delta h = cp\Delta T \quad \ldots\ldots (8)$$

and

$$\left(\frac{p_2}{p_1}\right)^{\frac{k-1}{k}} = \frac{T_2}{T_1} \quad \ldots\ldots (9a)$$

$$\left(\frac{p_4}{p_5}\right)^{\frac{k-1}{k}} = \frac{T_4}{T_5} \quad \ldots\ldots (9b)$$

equations (2) and (5) become

$$\frac{v_2^2}{2gJ} = CpT_1\left(1 - \frac{T_2}{T_1}\right) = C_pT_1\left[1 - \left(\frac{p_2}{p_1}\right)^{\frac{k-1}{k}}\right] \ldots (10)$$

$$\frac{v_4^2}{2gJ} = CpT_5\left(1 - \frac{T_4}{T_5}\right) = C_pT_5\left[1 - \left(\frac{p_4}{p_5}\right)^{\frac{k-1}{k}}\right] \ldots (11)$$

c. Substituting equations (10) and (11) into (7),

$$(1+w)^2 = \frac{T_1}{T_5}\left[\frac{1 - \left(\frac{p_2}{p_1}\right)^{\frac{k-1}{k}}}{1 - \left(\frac{p_4}{p_5}\right)^{\frac{k-1}{k}}}\right] \quad \ldots\ldots (12)$$

d. From equation (1)

$$\frac{T_5}{T_1} = \frac{T_3}{T_1} + \frac{1 - \frac{T_3}{T_1}}{1+w} \quad \ldots\ldots (13)$$

e. Substituting equation (13) into (12) and solving for w from the resulting quadratic equation,

$$w = \frac{1}{2T_3}\left\{\left[(T_1 - T_3)^2 + 4T_1T_2\,\frac{1 - \left(\frac{p_2}{p_1}\right)^{\frac{k-1}{k}}}{1 - \left(\frac{p_4}{p_5}\right)^{\frac{k-1}{k}}}\right]^{\frac{1}{2}} - (T_1 + T_3)\right\} \quad \ldots\ldots (14)$$

2. Procedure.

a. Substitute various values of p_5 into equation (14) and solve for w, keeping p_4, p_2, p_1, T_1 and T_3 constant.

b. Plot curve of w vs. p_5 or w vs. p_5/p_4.

APPENDIX I, SECTION 2
CALCULATIONS FOR THE DESIGN OF GAS-JET COMPRESSORS

Assumptions:

Line operating pressure = 700 psia = p_5
High-pressure (motive pressure) = 900 psia = p_1
High-pressure (motive gas) Temp. = 90° F.
High-pressure (motive gas) Sp. Gr. = 0.65
High-pressure (motive gas) $K = C_p/C_v$ = 1.28 Btu/lb./°F.
Low-pressure (suction gas) = 500 psia = p_3
Low-pressure (suction gas) Temp. = 80° F.
Low-pressure (suction gas) Sp. Gr. = 0.65
Low-pressure (suction gas) $K = C_p/C_v$ = 1.28 Btu/lb./°F.

Let N = K-1/K = 1.28 — 1/1.28 = 0.219

where

1. K = 1.28
2. $A = p_2/p_1 = 500/900 = 0.555$
3. $A^N = (0.555)^{.219} = 0.879$
4. $p_4/p_5 = 500/700 = 0.714 = C$
5. $C^N = (0.714)^{.219} = 0.929$
   where (See Figure 10)
   $p_2 = p_3 = p_4 = 500$ psia.
   $p_1 = 900$ psia.
   $p_5 = 700$ psia.
6. $t_1 = 90°$ F. = 550° R. or $T_1 = 550°$ R.
7. $t_3 = 80°$ F. = 540° R. or $T_3 = 540°$ R.
8. $A^NT_1 = 0.879 \times 550 = 483°$ R. or $T_2 = 483°$ R.
9. $T_1 - T_2 = 550 - 483 = 67°$ R.
10. $4T_1T_3 = 4 \times 483 \times 540 = 1.041 \times 10^6$
11. $(T_1 - T_3)^2 = 100$
12. $(1 - A^N) = 1 - 0.879 = 0.121$
13. $(1 - C^N) = 1 - 0.929 = 0.071$
14. W = lbs. of suction fluid compressed per lb. of motive fluid

$$W = \frac{1}{2T_3}\left\{\left[(T_1 - T_3)^2 + 4T_1T_3\left(\frac{1 - A^N}{1 - C^N}\right)\right]^{\frac{1}{2}} - (T_1 + T_3)\right\}$$

$$W = \frac{1}{1080}\left\{\left[100 + 1.041 \times 10^6\left(\frac{0.121}{0.071}\right)\right]^{\frac{1}{2}} - 1090\right\}$$

W = 242/1080 = 0.224 with 100 percent efficiency.

Assuming an efficiency of 65 percent through Venturi Section:

$$W = .224 \times 0.65 = 0.145\ \frac{\text{lbs. suction gas}}{\text{lbs. motive gas}}$$

1/W = 1/.145 = 6.9 lbs. of motive/lb. of suction gas
Vol/Vol = 6.9 Mcf motive gas/Mcf suction gas
2.5 Mmcf/day of motive will compress 362 Mcf/day of suction gas
Total flowing into line = 2.5 + 0.36 = 2.86 Mmcf/day
3 Mmcf/day of motive will compress 435 Mcf/day of suction gas
Total flowing into line = 3.435 Mmcf/day.
3.5 Mmcf/day of motive gas will compress 506 Mcf/day of suction gas
Total flowing into line = 4.06 Mmcf/day.

Continued on Page 37

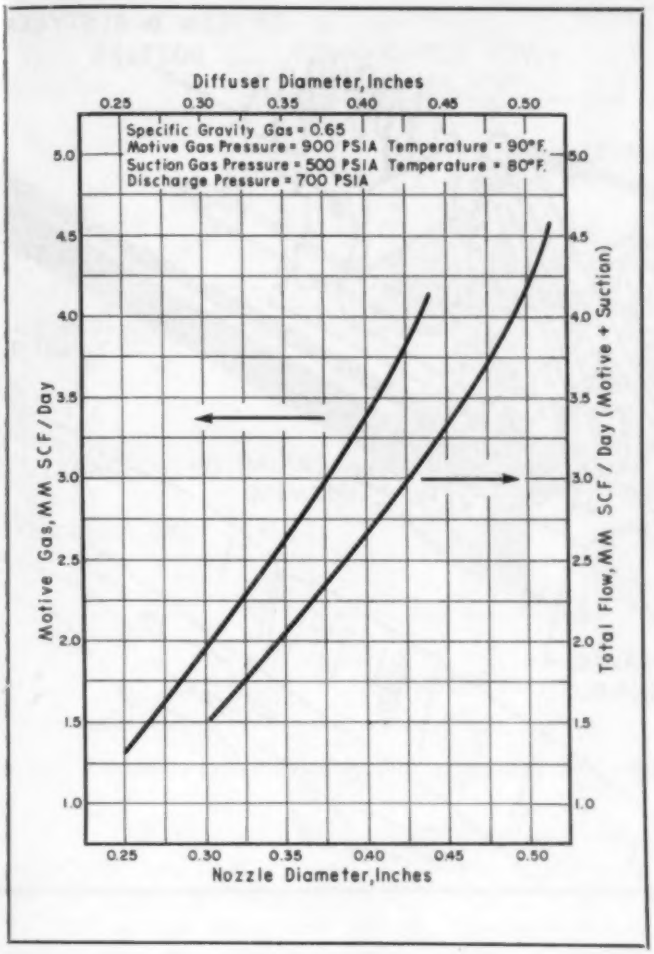

Diffuser Diameter, Inches
0.25 0.30 0.35 0.40 0.45 0.50
Specific Gravity Gas = 0.65
Motive Gas Pressure = 900 PSIA Temperature = 90°F.
Suction Gas Pressure = 500 PSIA Temperature = 80°F.
Discharge Pressure = 700 PSIA
Motive Gas, MM SCF/Day
Total Flow, MM SCF/Day (Motive + Suction)
5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0
Nozzle Diameter, Inches

Fig. 8—Relationships of nozzle diameter to total flow and diffuser diameter to rate of motive gas flow for one set of conditions noted on the curve.

Nozzle Design

1. Standard cu. ft./lb. motive gas $= \frac{379}{28.96 \times 0.65}$
   $= 20.15$ cu. ft./lb.

2. $\frac{2.5}{20.15}$ Mmcf/day motive gas $= 124{,}000$ lbs./day

   $\frac{124{,}000}{24 \times 60 \times 60} = 1.44$ lbs./sec. = weight

3. $v_1 = 20.15$ cu. ft./lb. $\times \frac{14.7}{900} \times \frac{550}{520} = 0.347$ cu. ft./lb.

4. $v_2 = v_1(p_1/p_2)^{1/k} = 0.347 \times \left(\frac{1}{.555}\right)^{\frac{1}{1.28}} = 0.55$ cu. ft/lb.

5. $V_2 = \sqrt{\frac{2gk}{k-1}(p_1v_1 - p_2v_2) + V_1^2}$

Assuming upstream velocity V_1 in flow line (neg.)

6. $V_2 = \sqrt{\left(\frac{2gk}{k-1}\right)(p_1v_1 - p_2v_2)} =$

$\sqrt{\left(\frac{2 \times 32.17 \times 1.28}{1.28 - 1}\right)(900 \times 144 \times .347 - 500 \times 144 \times .55)}$
$= 1250$ ft./sec.

7. $A_2 = \frac{Wtv_2}{V_2} = \frac{1.44 \times 0.55}{1250} \times 144 = 0.0912$ sq. in.

8. $A_2 = \frac{\pi d^2}{4}$ $\qquad d = \sqrt{A^2 \frac{4}{\pi}} = \sqrt{\frac{.0912 \times 4}{A}}$
   $= 0.341$ in.

Diffuser Design

1. scf/lb. $= 20.15$cf/lb.

2. $362{,}000/20.15 = \frac{18{,}000}{24}$ lb./day $= \frac{750}{60}$ lb./hr. =
   12.5 lb./min. $12.5/60 = 0.208$ lb./sec. suction gas

3. W = 0.145 lb. of suction gas per pound of motive gas

4. $T_3 = T_1\left[\frac{\frac{T_2}{T_1} + 1 - \frac{T_2}{T_1}}{1 + w}\right] = 550\left[\frac{\frac{540}{550} + 1 - \frac{540}{550}}{1 + .145}\right] = 548°$ R.

5. $v_3 = 20.15 \times \frac{14.70}{700} \times \frac{548}{520} = 0.446$ cu. ft./lb.

6. $v_4 = 0.446 \quad \left(\frac{700}{500}\right)^{\frac{1}{k}} = 0.446\ (1.4)^{.782} = 0.582$ cu. ft./lb.

7. $A_4 = \frac{(1.44 + 0.208)\ 0.582 \times 144}{1250 \times 0.85} = 0.130$ sq. in.

where 0.85 = coefficient of discharge

8. $d_4 = \sqrt{\frac{4 \times 0.130}{3.1416}} = 0.406$ in.

3 MM scf/day (motive) 0.435 MM scf/day (suction)

Weight of motive $= \frac{3\text{ MM}}{20.15 \times 24 \times 60 \times 60} = 1.73$ lb./sec.

$A_{(nozzle)} = 0.11$ sq. in. $\qquad d = \sqrt{\frac{0.11 \times 4}{\pi}} = 0.374$ in.

3.5 MM scf/day (motive) 0.506 MM scf/day (suction)

Weight of motive $= \frac{3.5\text{ MM}}{20.15 \times 24 \times 60 \times 60} = 2.02$ lb./sec.

$A_{(nozzle)} = 0.1285$ sq. in. $\qquad d = \sqrt{\frac{0.1285 \times 4}{\pi}} = 0.405$ in.

$(1.73 + 0.25) = 1.980$ total flow lb./sec.

Diffuser diameter $= 0.406\sqrt{\frac{1.98}{1.648}} = .445$

$(2.02 + 0.292) = 2.312$ total flow lb./sec.

Diffuser diameter $= 0.406\sqrt{\frac{2.312}{1.648}} = .48$

General Equation.

Nozzle diameter $= 0.341\sqrt{\frac{Q\text{ M scf/day}}{2500}}$

Diffuser diameter $= 0.406\sqrt{\frac{(Q_{motive} + Q_{suction}) \times \text{M scf/day}}{(2500 + 362)}}$

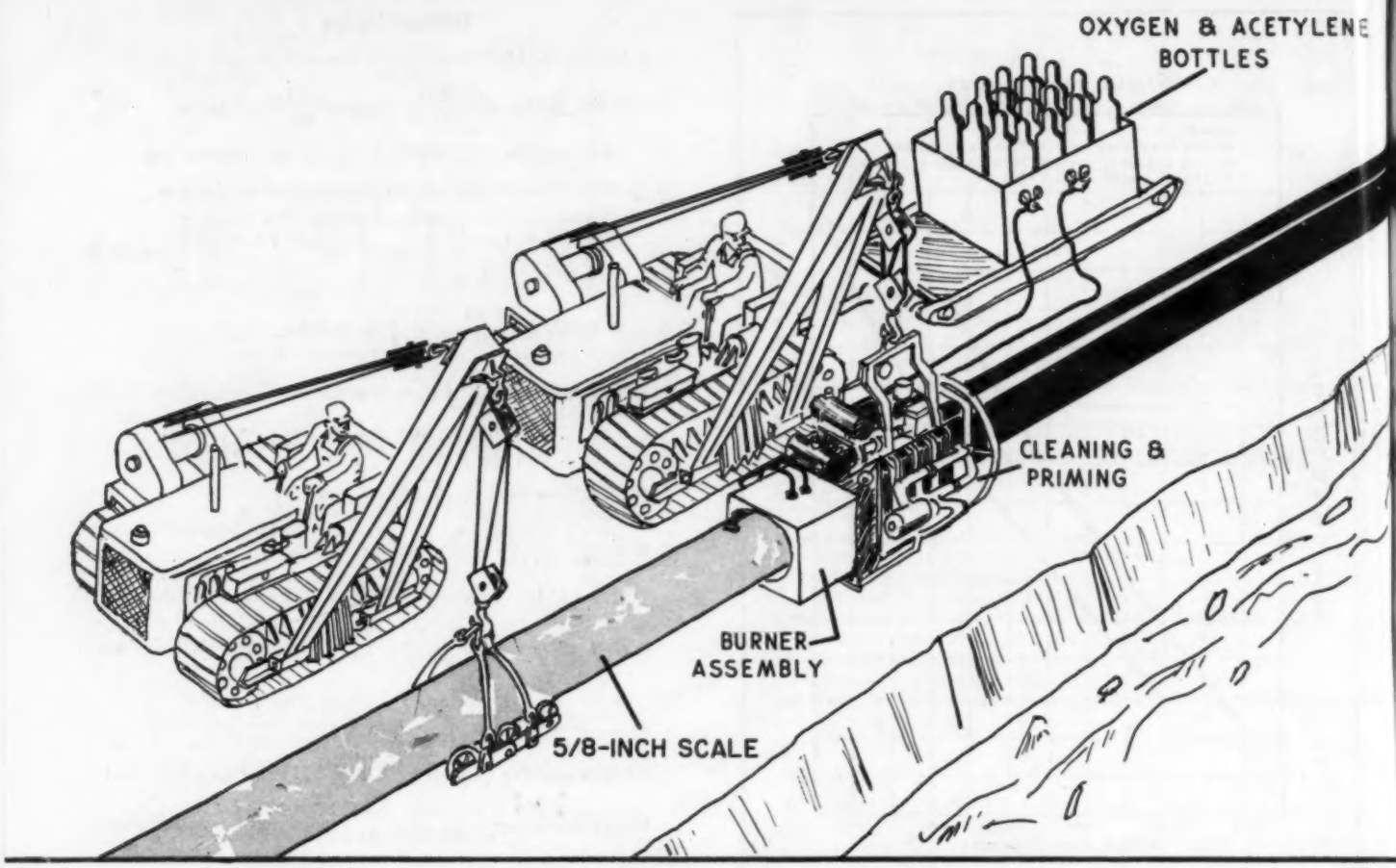
900 psia motive pressure
500 psia suction pressure
700 psia discharge pressure

Motive Gas scf/day	Suction Gas scf/day	Nozzle Diameter inches	Diffuser Diameter inches
2500 Mcf/day	362 Mcf/day	0.341	0.406
3000 Mcf/day	435 Mcf/day	0.374	0.445
3500 Mcf/day	506 Mcf/day	0.405	0.480
2000 Mcf/day	290 Mcf/day	0.306	0.363
1500 Mcf/day	218 Mcf/day	0.264	0.315
4000 Mcf/day	580 Mcf/day	0.433	0.514

ACKNOWLEDGMENT

The authors wish to acknowledge the help and encouragement in this work by Walter B. Saner, James G. Badgett and Roy A. Schuster of The Chicago Corporation, and James E. Pew of Sun Oil Company.

—The End



Flame-Cleaning Machine Removes Pipe Line Scale

This new machine removes oxide scale and cleans and primes pipe while moving down the line at 500 feet per hour. Cost is only a few cents a foot.

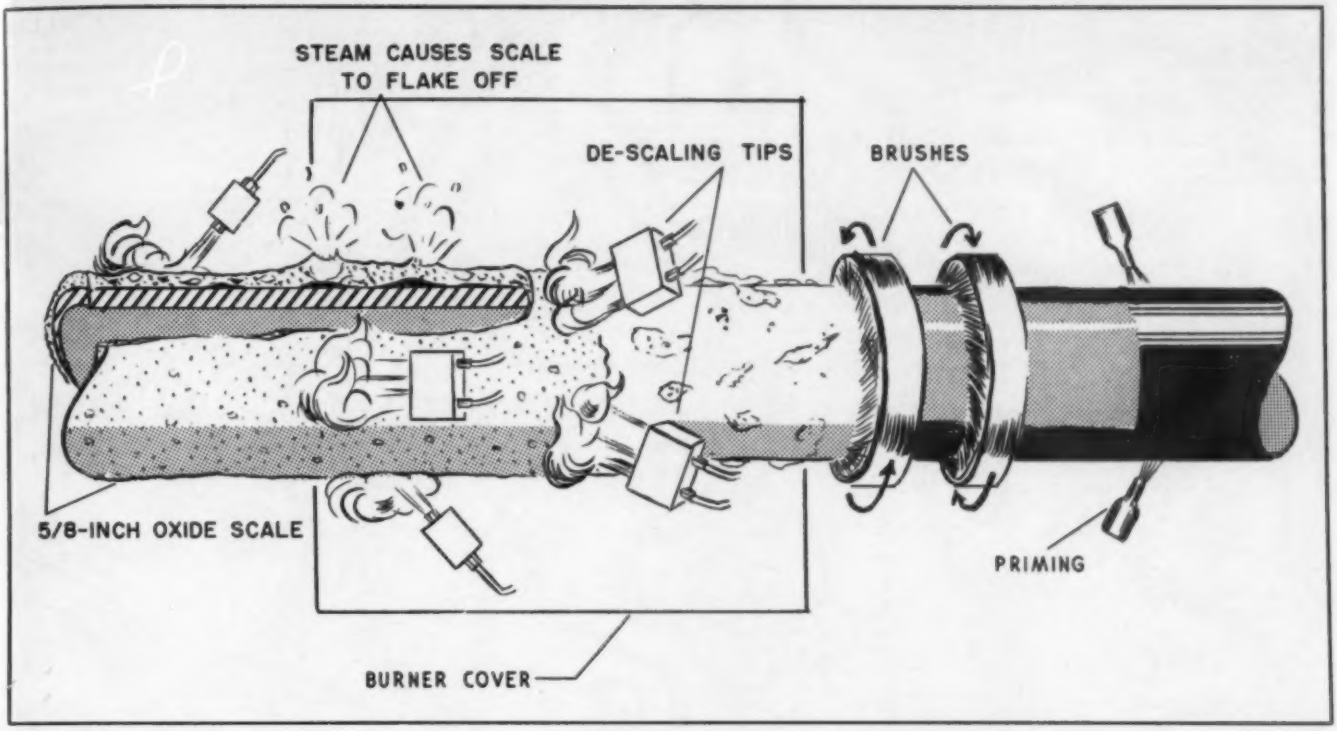
By B. LEONARD SHERROD, President,
Gulf Welding and Machine Works, Conroe, Texas

A FLAME-CLEANING machine that travels down the pipe line almost as fast as an ordinary cleaning and priming machine was developed to remove 5/8-inch oxide scale from an uncoated pipe line. The line had operated at a temperature of 160° F. for about ten years and the oxides were too hard for ordinary over-the-ditch cleaning machines.

Two factors enter into the operation of the flame-cleaner. One is the difference of the co-efficient of expansion of the parent-metal and the oxides to be removed. The other is the moisture content of the oxide. The heat of the flames penetrating the oxides causes the moisture to expand with almost explosive force, thereby loosening part of the oxide. If the moisture content is low in the oxide, a spray ahead of the cleaning machine will overcome the dryness.

The machine was developed in the fall of 1953 to recondition over the ditch approximately 40 miles of pipe, varying in size from 3½ inches to 12¾ inches and to replace approximately 21 miles of pipe with new or reconditioned pipe. The pipe had been laid in 1942, 1943 and 1944 without a protective coating. At the time, enamel manufacturers were unable to supply a protective coating that would withstand a temperature of 160-170° F., which was the operating temperature of these lines. After ten years, some of these lines failed because of external corrosion, and the rest showed signs of reduced wall thickness due to corrosion. The contract for reconditioning called for the pipe to be cleaned and coated with an enamel that would withstand an operating temperature of 225° F.

In the process of reconditioning the line, the pipe was uncovered, cradled out of the ditch and laid on skids where the latest model cleaning



Artist's conceptions of new flame-cleaner moving down line (opposite page) and a close-up of flame-cleaner in action (above).

machine with twin counter rotating heads (the first head equipped with borium tipped, spring-loaded knives and the second head with spring-loaded burrs and steel wire brush) was passed over the pipe. The machine would not satisfactorily clean the scale off the pipe, nor would it clean the pipe satisfactorily on six trips over the same section of pipe. A liquid solvent was applied to no avail.

On the first trip, the machine would remove looser particles of soil and oxides, but not the oxides as hard or harder than the borium tips of the knives.

Some of the pipe had earlier been cut into sections, hauled to a stationary metal blast machine where the surface of the pipe, as well as the pits, had been cleaned of oxide. To cut, haul, blast clean, reassemble and weld the sections at the ditch would have increased the cost of the job at least $500,000. Replacing the corroded pipe with new pipe, would have added $1 million to the cost. The metal blast machine was not available to the industry as a portable unit.

To overcome these difficulties a line-travel flame-cleaning machine was designed. A frame 42 inches long and of height and width that would permit it being connected to the front of a conventional cleaning machine was constructed. Stationary split-header rings were fastened to the front and rear of the frame. To these rings, oxyacetylene torches equipped with 6-inch descaling tips were attached. A sufficient number of torches were fastened on the header rings to completely encircle the circumference of the pipe with flame from the de-scaling tips.

It was found that by placing half the required number of torches at the rear header plate, overheating and pre-combustion were practically eliminated. The oxides that did not fall loose from the pipe were removed by the conventional cleaning machine immediately behind the flame cleaner. Temperature of the pipe being cleaned was regulated by increasing or decreasing the rate of travel of the cleaner.

Fuel for the operating of the torches, were supplied from a sled pulled by the sideboom tractor that cradled the pipe for the flame-cleaning. Twenty-one cylinders of oxygen were manifolded together along with 16 cylinders of acetylene. Both manifolds were equipped with dual regulators, which fed into a flexible hose which in turn allowed the fuel to flow to the flame-cleaning machine. The quantity of acetylene would supply the machine with fuel for a period of approximately four hours. The oxygen supply would last approximately eight hours. The above fuel consumption is based upon the use of six six-inch descaling tips.

The 6-inch descaling tip consumed 2.8 cubic feet of acetylene gas per minute combined with 1.8 cubic feet of oxygen, thus generating 25,000 B.T.U. of heat at 2600 to 3000° F. With acetylene gas costing $3 per hundred cubic feet and oxygen $1.15 per hundred cubic feet, the fuel cost per minute was .6282 cents, or $150.73 per hour. The cleaning machine propelled the flame at a speed of 500 feet per hour in low gear, making the cost for flame cleaning 9.42 cents per lineal foot of pipe or 2.82 cents per square foot of surface on 12¾-inch pipe. The speed of 500 feet per hour was slow enough to successfully clean the worst corrosive condition encountered. In cleaning 40.35 miles of pipe 3½ inches to 12¾ inches in diameter, the oxygen and acetylene cost was $13,100 or an average of 5.7 cents per lineal foot. —**The End**

ACKNOWLEDGMENT

This article abstracted from a paper presented March 23, 1955, at International Acetylene Association Convention in Houston.

SHELL'S STREAM BLENDING PLANT is incorporated into the pump station just outside the refinery fence at Wood River. The refinery manufactures only base stocks which are components of the products which are blended directly into the pipe line.

How Stream Blending Works

At Shell's Wood River plant, petroleum products are automatically precision-blended as they enter the pipe line. It requires only a few seconds to change from product to product.

By RUDY LOWE, President, Proportioneers, Inc., Providence, R. I.

COMPLETED LAST YEAR, Shell Products Pipeline's Stream Blending plant at Wood River represents the final step towards eliminating batch processing. There blending is a continuous and automatic process. In addition, the plant goes one more step; in contrast with the few stream blenders which have been built before, this one delivers directly into the pipe lines which carry the gasoline and other products from the refinery to market.

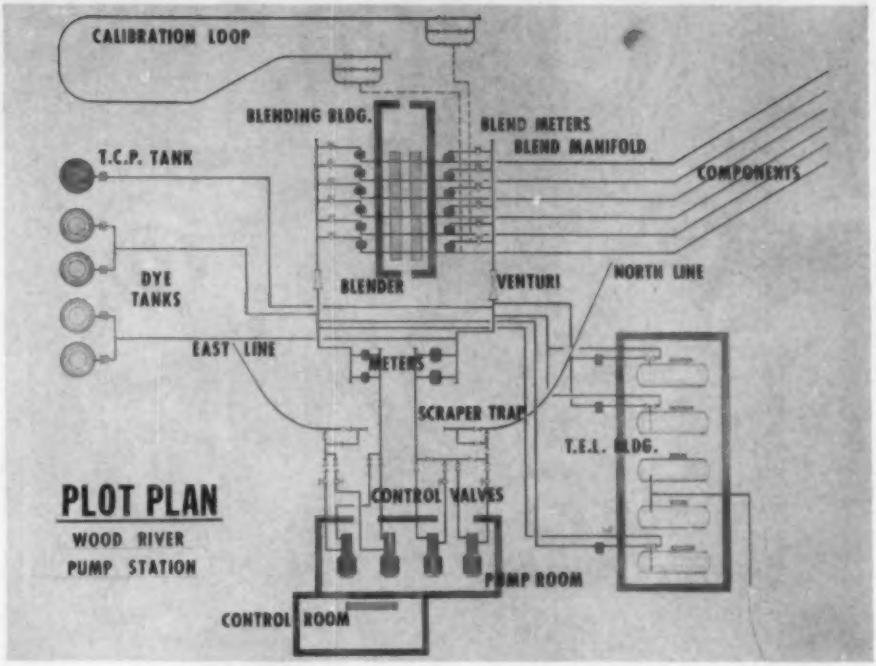
The development came about as the result of an expansion of plant facilities. Normally such an expansion would require additions to the blending, shipping and seasonal storage tanks. As a means of conserving inventory space and reducing investment in tankage, Shell engineers investigated the possibility of blending base stocks and additives directly into the intake of the pipe line. It was clear that if this could be done successfully, there would be significant savings, not only in the number and size of tanks required, but also in the inventories of blended or partially blended stocks, and in the vapor losses which ordinarily occur during tank blending operations and the handling incident thereto.

Other continuous blenders had been built previously for solvents, gasolines, lubricating oils, asphalts, fuel oil and the like, but in no case were the problems similar to those encountered in a pipe line operation. The problem which confronted the engineers in this case was that of designing a system in which each component was individually regulated to maintain a fixed percentage of the total flow, while the total flow was itself to be automatically regulated to match the variable intake requirements of the pipe line. In order to solve this problem, a number of new and novel features were required, the final design representing a composite of the efforts of Shell Products Pipe line and Proportioneers, Inc. engineering.

The conventional method of stream blending gasoline has been to use individual rate controllers consisting of a differential producer, an air instrument and an automatic control valve on each component stream. This method, however, required manual resetting of each flow rate whenever a change in total throughput was desired and this made it necessary to blend to an intermediate storage tank at constant rate because of the inability of such equipment to follow the varying pipe line demands.

The final blender as designed for pipe line service not only automatically follows pipe line requirements but also includes a built-in "memory" for each component stream so that shortages due to a tank switch or pump failure are recorded and can be made up during the transfer of a tender. An electrical supervisory system consisting of warning lights, limit switches and an audible alarm enable the operator to easily spot any failure in the component supply system and rectify the difficulty.

So many monitoring devices have been incorporated into the mechanism that it is virtually fool-proof. As an example, the meters which are of the positive displacement type (for pipe line accounting) can be calibrated and factored while in operation. This is accomplished by means of a "calibration loop" which is incorporated into the base stock feed system and manifolded in such a way that any meter can be calibrated with the particular stock it is handling without interrupting the blend. This "known volume" section of line can handle any component at the actual operating temperature, pressure and flow rate occurring during a blending operation. Since it forms a closed system, it is more flexible than the ordinary calibration tank and for the first time offers a means of calibrating butane streams.



SCHEMATIC DIAGRAM of the blending plant and pump station. Station suction pressure controls the master drive on the blending panel board.

Six base stock streams are handled and proportioned by the blender as well as tetraethyl lead, Shell's TCP additive, Shell's pipe line inhibitor, and two or more additives which cannot be named at this time. The major elements of the system are as follows:

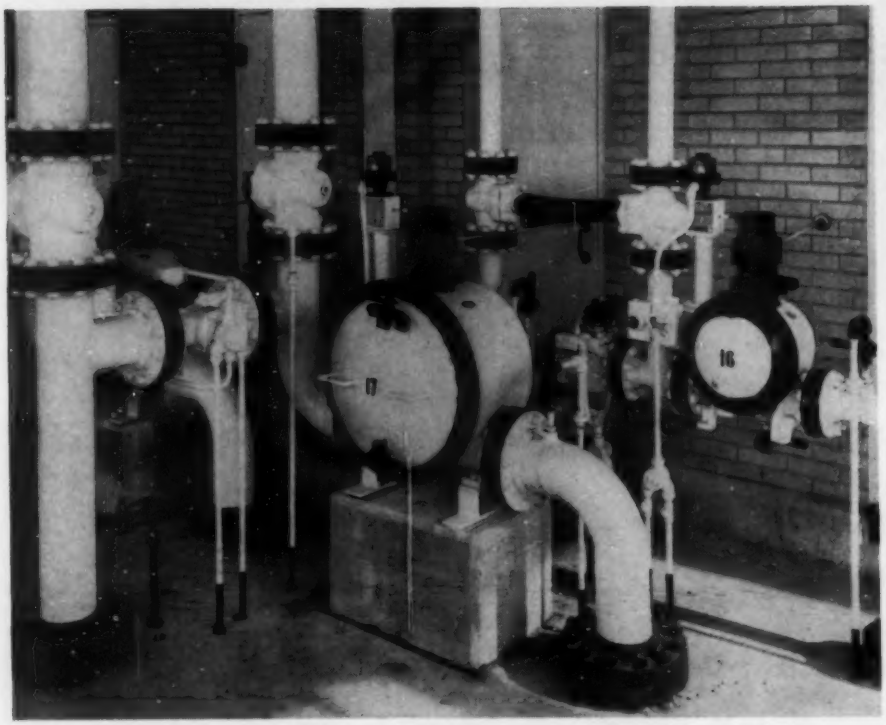
(1) A computer system, which is primarily a motor-driven variable speed line shaft, governing the input to six variable ratio drives which separately set up the demand rates for each of the six component streams.

(2) The metering system, consisting of one or more positive displacement meters for each stream, sized to cover the range of rates which may be desired in any blend at any throughput.

(3) The mechanical tie between the meters and the computer system; this consists of a differential which identifies a slow or fast metering rate for each component, and converts this to a controlling action by a pneumatic instrument; this, in turn, governs the throttling action of the control valve handling that particular stream.

(4) The master control, which operates from the pipe line station's

BLENDING CONTROL PANEL BOARD combines control of component streams, annunciation of trouble, off-blends, etc. A memory totalizer insures that proper amount of base stock, etc. will be pumped into line even though one of the component streams should fail temporarily.



POSITIVE DISPLACEMENT METERS, located outside control room, measure various base stocks as they go into the suction of station. A shaft from each meter runs through wall to panel board.

suction pressure, and regulates the speed of the main computer shaft proportionately to the volume demand of the pipe line.

(5) Various monitoring lights and controls which signal failures in any part of the system. There are also component totalizers which register the delivered quantity of each component in terms of barrels of total delivery, and limit switches which sound alarms to notify the operator of any off-specification blend.

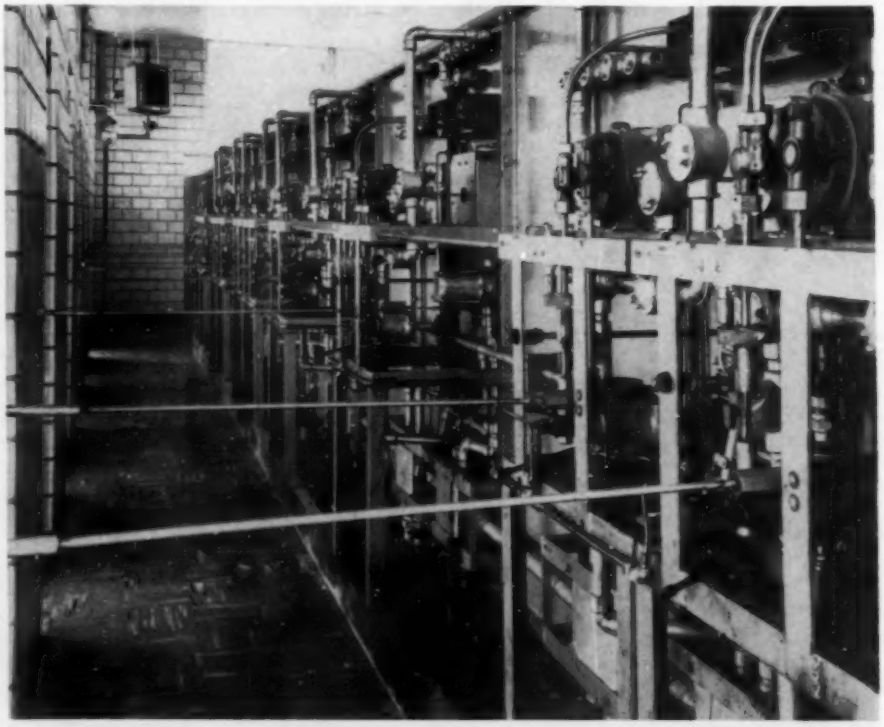
(6) The "memory" totalizers which also read in barrels and which are operated from the spider of the differential control unit. These totalizers make available the data of any component shortage caused by the momentary failure of a base stock stream and enable the operator to make up the deficiency following the sounding of the alarm.

(7) Automatic sample collectors which obtain weighted composite samples of the delivered blend at previously determined intervals.

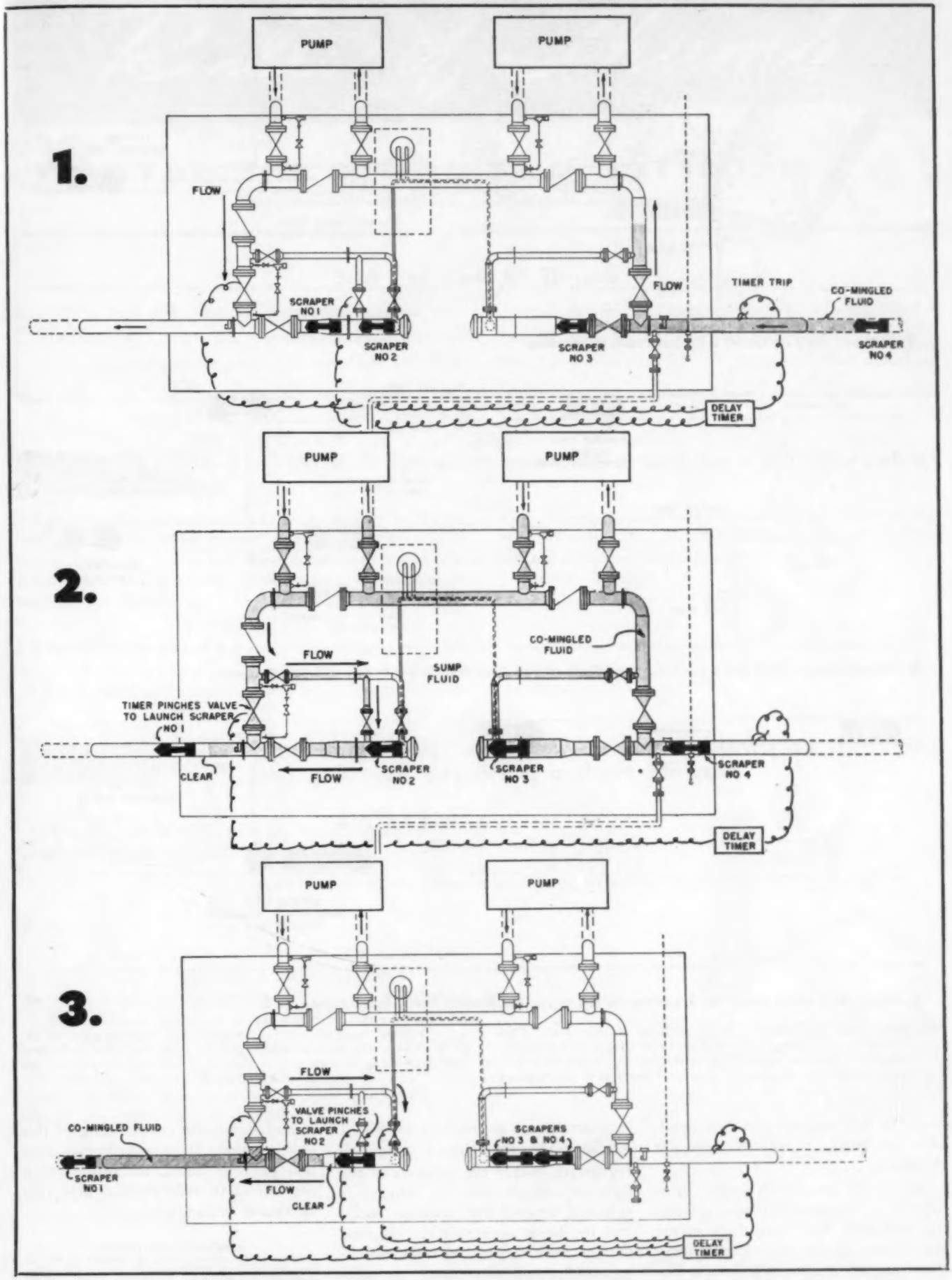
Operation is simple. Although this description may seem to make the blender sound complicated, it is actually very simple in operation. Before a run is scheduled, the operators are furnished with the blend composition for a given gasoline. The percentages of the various components are then determined based on the meter factors established by the calibration loop. These settings are made on the individual component panels, and from adjacent pump control panels, test starts are made on the respective component pumps, which are located at the refinery rundown tanks several thousand feet away. When all of the percentages are set and all of the test starts indicate that the components are available at the blender, the blender circuits are switched over to the pipe line pump control room. From this time on, the blender is under remote control from the pipe line pump station. This arrangement was chosen because all other deliveries from the refinery are controlled from this point, and it was not desired to make a special operation out of the delivery of a blended product. It is not even necessary to maintain constant attendance of an operator at the blender.

The two stream blenders have been in operation for a year, one serving the Wood River-Lima pipe line with a daily capacity of 38,000 barrels, and the other, the Wood River-Chicago line, with a daily capacity of 85,000 barrels.

When either of the two lines is pumping a product other than gasoline, its associated blender may be operated into tankage as a constant-rate system, by setting the master controller at the desired rate. Blends

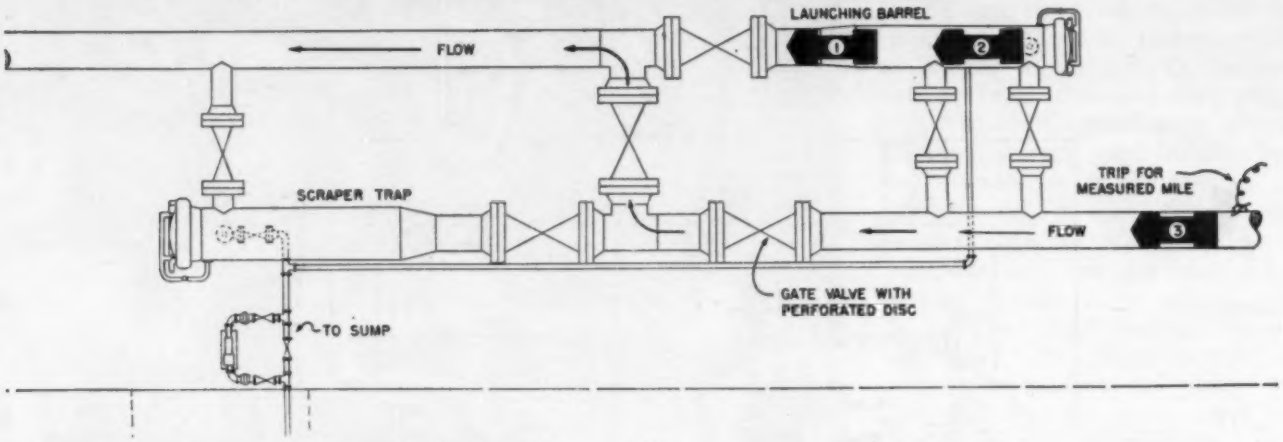


BACK OF PANEL BOARD showing shafts from individual meters. Should an insufficient amount of one of the component products enter line to station suction, the shaft from the meter on that particular line would slow down. Its rotation would be slower than the drive from the proportioning device. Through an instrument, this would signal the control valve on this particular products line to open and admit a larger stream to station suction.

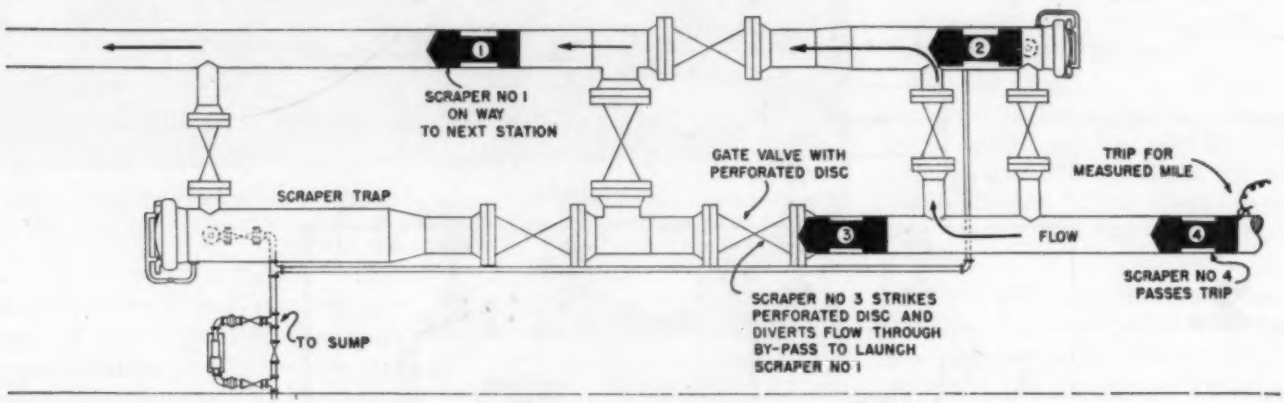


Here is how the comingled fluid between tenders is encompassed as it goes through a pump station.

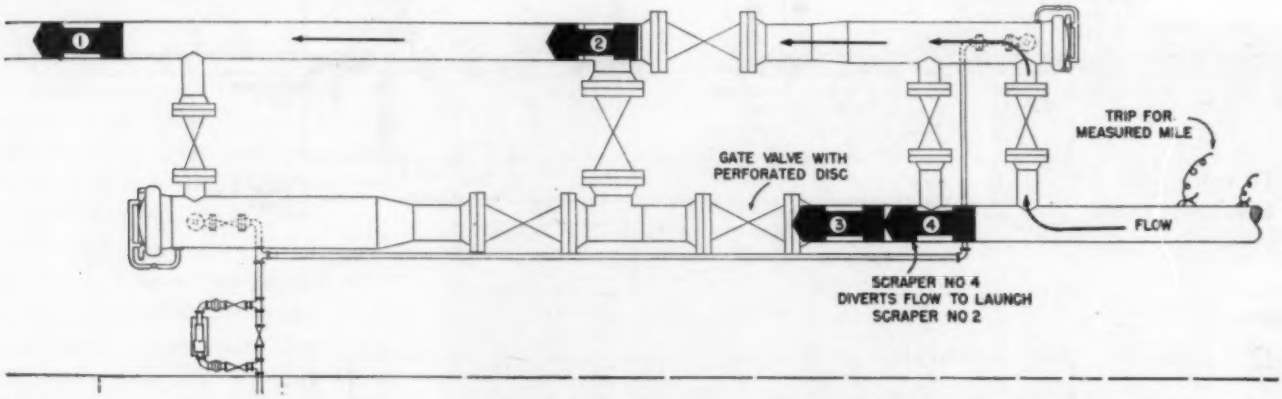
Here's how scrapers are launched at the end of the "Measured Mile"



1. Scrapers 1 and 2 are spotted in the barrel ready for launching.


SCRAPER NO 1 ON WAY TO NEXT STATION
GATE VALVE WITH PERFORATED DISC
TRIP FOR MEASURED MILE
SCRAPER TRAP
FLOW
SCRAPER NO 4 PASSES TRIP
SCRAPER NO 3 STRIKES PERFORATED DISC AND DIVERTS FLOW THROUGH BY-PASS TO LAUNCH SCRAPER NO 1
TO SUMP

2. Incoming Scraper No. 3 strikes perforated disc of gate valve to divert flow through by-pass to launch Scraper No. 1.



3. Scraper No. 4 strikes Scraper No. 3, pinching the first by-pass and diverting flow to launch Scraper No. 2.

METERS ARE CALIBRATED by sections of pipe line. This practice enables accuracy of calibration to be within 0.01 percent. On downstream section, appropriately dubbed the "miracle mile," the above installation is required because a portion of the tenders are separated mechanically by scrapers. The ingenious piping arrangement above permits scrapers to be launched after the meter calibration run in such a way that they will encompass any comingled fluid.

made in this manner are then available for truck, barge, or tank car shipment.

All blends are made under pressure in a completely closed system; the turbulent flow conditions in the line insure all the mixing necessary; there are no evaporation losses. Experience has been that the component measurement is accurate to within 0.1 percent. The total blend volume is registered, as are the volumes of the separate components. No tankage is required beyond the rundown tanks, and the labor saving by the elimination of tank gaging, manual switching, and pump attendance, as compared with ordinary batch blending is a very significant contribution of this development. It is anticipated that this plant is but a forerunner of a new trend in refinery and pipe line operation techniques.

ACKNOWLEDGEMENT

The author wishes to thank Sydney S. Smith, formerly of Shell Oil Company, now a consulting engineer, for his help in preparing this article.

—**The End**

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to Donald M. Taylor, Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

Corrosion Protection

—11—What is the most economical size for a rectifier cable?

Choosing the economical size for a rectifier cable involves balancing the first cost of the cable against the power losses. A rule which does not include all of the factors, but which usually gives a very close approximation, is as follows:

$$a = 2280\ I\ \sqrt{P},$$

where "a" is the area of the cable in circular mils (refer to a wire table for size), I is the current to be carried, in amperes, and P is the cost of power in cents per kilowatt-hour. This formula is based on the present prices of copper cables, and assumes the use of a good grade of direct burial cable.

Example: Suppose I = 60 amps

P = 4 cents

$a = (2280)\ (60)\ (\sqrt{4})$

a = 273,600 circular mils

Cable is sized 250,000 and 300,000 circular mils. Use the latter.

Miscellaneous

—20—How to estimate the amount of gas blown off through a line puncture or during a short-blowoff.

To calculate the volume of gas lost from a puncture or blowoff, use the formula:

$$Q = D^2P_1$$

Where

Q = volume of gas in Mcf/hour at a pressure of 14.9 psi, 60° F. and with a specific gravity of 0.60;
D = diameter of the nipple or orifice in inches; and
P = absolute pressure in pounds per square inch at some nearby point upstream from the opening.

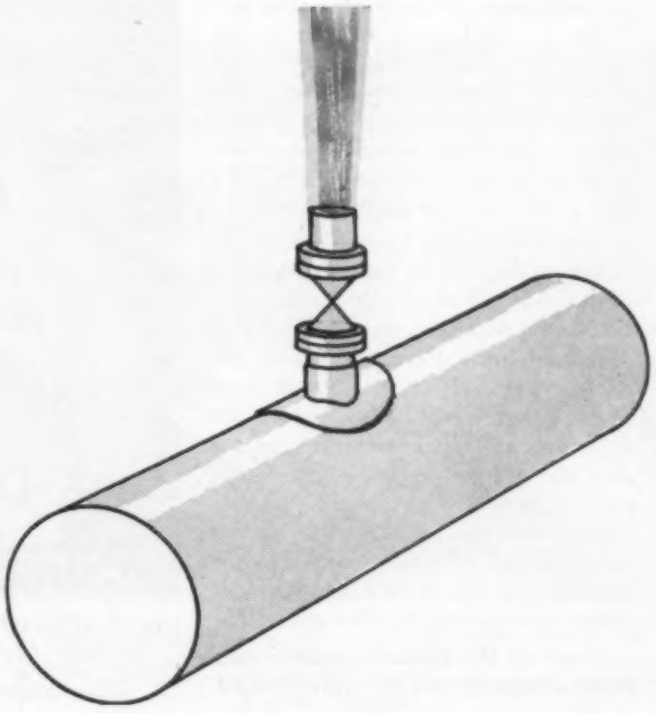
Example: How much gas will be lost during a five minute blowoff through a two-inch nipple if the upstream pressure is 1000 psi absolute?

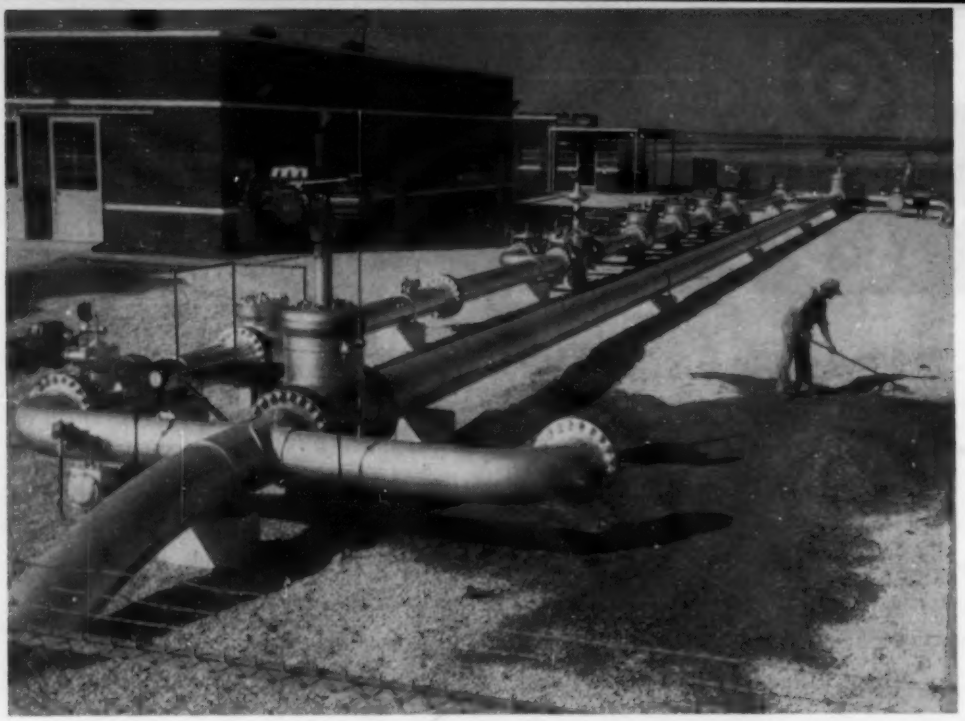
$Q = D^2P_1$

$Q = (2)^2 \times 1000$

$Q = 4000$ Mcf/hour

$$Q_{5\ min} = 4000 \times \frac{5}{60} = 333 \text{ Mcf.}$$





MANIFOLD ON PLATTE PIPE LINE COMPANY'S new pumping station near Holdrege, Neb. Crude enters in upper right and leaves at lower left. Main control valve on discharge line is in upper center portion of picture.

Automation in Action

Platte Pipe Line Company has applied the latest in pipe line station automation at its new station near Holdrege, Neb.

PLATTE PIPE LINE COMPANY of Kansas City, Missouri, is carrying out an expansion program with the addition of six booster stations on its 20-inch line from the oil fields of Wyoming to refineries in the Mid-Continent area. One of the six stations recently completed is located southeast of Holdrege in south central Nebraska and carries out the latest applications of pipe line station automation.

Essentially, the automation consists of pre-set control of the station suction and discharge pressures. The four pumping units have provisions for automatic shutdown in case the suction pressure falls below a pre-set minimum or the discharge pressure rises above a pre-set maximum. However, it is necessary to have the protective switches on only two of the units instead of four, since the two downstream units would not cause excessive pressure on the discharge.

Heart of the control system is the main discharge control valve which closes with pressure and opens on any type of failure. Pressure transmitters are connected to the discharge side of each of the pumps and the downstream side of the main discharge control valve. When the pressure on the downstream side of the control valve reaches a predetermined maximum, the control system automatically removes the upstream pumping unit from the line. When the discharge pressure becomes too high on any pump, the pump is automatically shut down by the mercury switch control in the pump room.

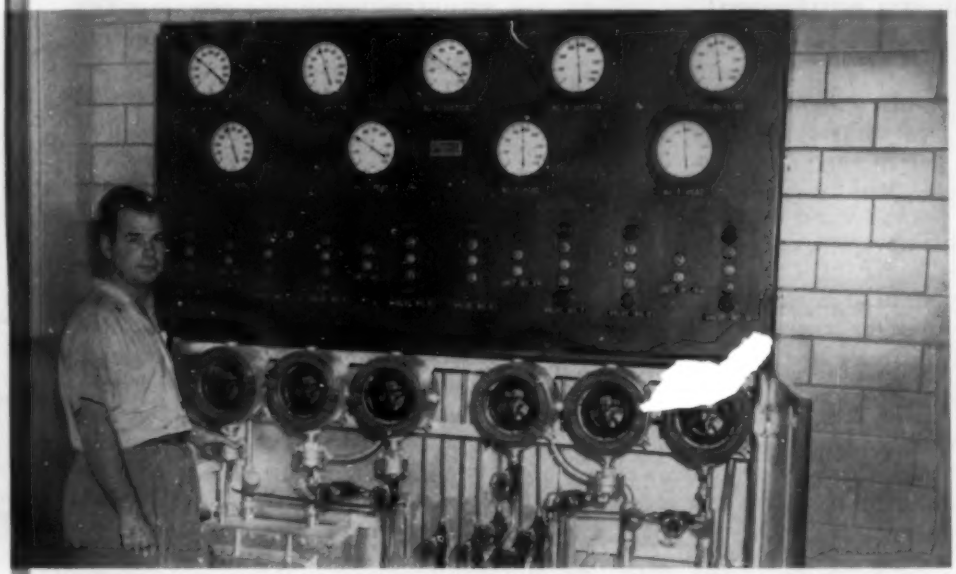
The four pumping units and two bypass valves are controlled from the dispatching center in Kansas City via the microwave system. The automatic controls regulate the pressure and motor currents in the station itself. Only one man is in attendance at the station. Secondary safety switches are connected to all vital points on the pumping units for automatic shutdown in case of emergency. These safety points include motor and pump bearing temperatures, pump case seal temperatures, and bearing seal housings, which utilize float switches. If at any of these points a pre-set limit is exceeded an alarm light is energized at the corresponding schematic posi-

DISCUSSING OPERATION of pressure transmitter on pump discharge line are Fred Jones (right) electrical engineer, and Walter Graff (left), resident operator in charge. Pressure chamber is connected to a differential transmitter which impresses an AC voltage proportional to pressure onto the signal line to recorder and controller.

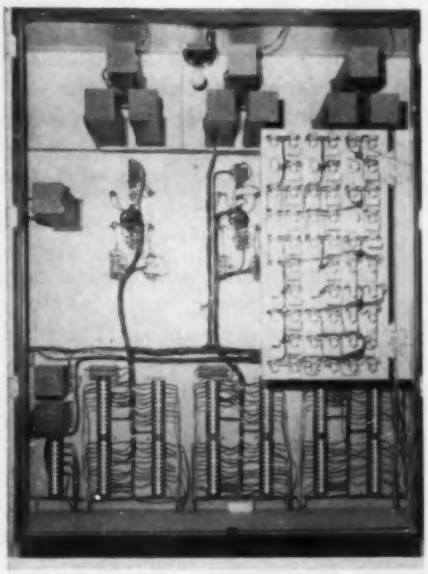
tion on the control panel. Provisions are made on the control panel to show the operator that each of the control lights is working properly. Periodic tests are made on the protective devices in the pumping room to see that they function on the preset limit.

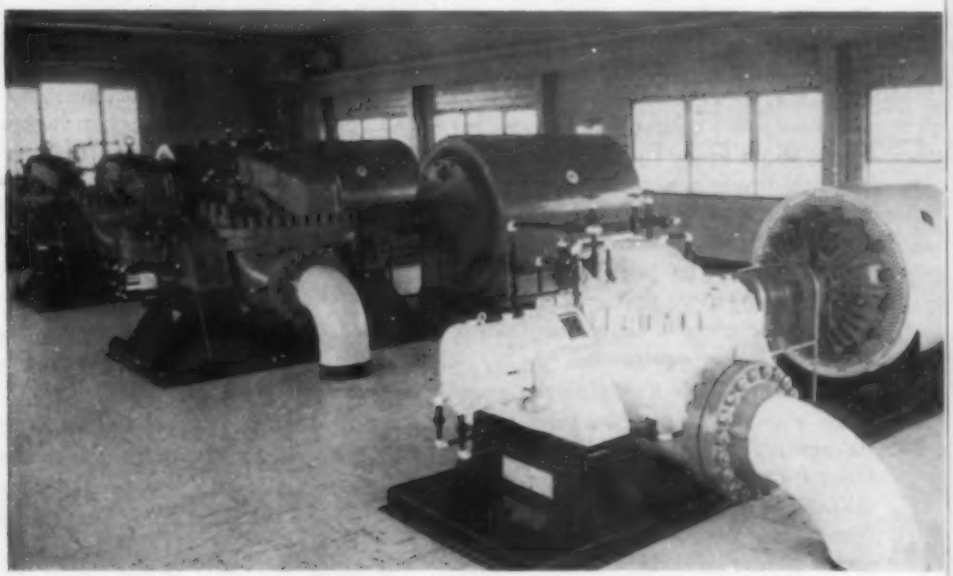
The pumping units are powered by three 1250 horsepower motors, and one 450 hp motor, all on three-phase current operating directly from a 2300 volt buss. Two-stage centrifugal pumps running at 1770 revolutions per minute capable of 5600 gallons per minute at 800 foot head are directly connected to the motors.

ALARM LAMPS on control panel light up when seals leak or bearing or case temperatures "run too hot." The lines and lights depict layout of piping system and show status of pumping units and valves. Demonstrating is Resident Operator Graff.



CONTROL PANEL is located inside pumping station. Denzel Perkins (left), district superintendent, rests his hand on one of the four diaphragm seals which control low suction shutdown of motors. The 3750-KVA substation is used to supply station from incoming 31.5 KV transmission line. Microwave station is at right.





CONTROL UNITS, sequence relay panels and terminal blocks (left). The three sets of instruments across top are recorder, indicator, and controller for each of three pumping units. Front view of instruments is shown in photo at upper right. In center of photo above, the relays of pumping unit sequence system appear on swinging panel. At bottom are interconnecting terminal blocks for station wiring system. Right is interior view of pump building, showing three 1250-HP motors with two-stage pumps connected.

What the Pipeliner Wants In a Microwave Radio Unit

It's not the initial cost that is important, but the upkeep. When it costs $25 to change a $3 tube, the answer is more rugged microwave equipment.

By F. VINTON LONG,
Texas Eastern Transmission Corporation, Shreveport, La.

THE IDEAL microwave radio unit for a pipe line company has not appeared on the market. Chances are it never will unless industry men are more emphatic in spelling out the technical requirements of the pipe line radio.

The pipe line industry needs a good but simple, heavy-duty, low-maintenance microwave communication system. It should not be over-designed nor under-designed. Under-designed means that the equipment was built to meet a competitive price, like the table model home radios you see in every drug store. Over-design means that the equipment has everything mounted on it but chromium air horns and a fancy spotlight. It works, yes, and provides a multitude of available circuits for future expansion, but the complexity of the accessories actually defeats the purpose of a reliable system—more time is spent maintaining the gadgets than maintaining the basic radio equipment.

Sometimes it is hard for the engineer who all his life has been trying to squeeze the last ounce of effort from tubes and parts for competitive selling, to realize the importance of heavy duty tubes and components. It seems particularly difficult for him to absorb the design philosophy that AC commercial power is the least expensive item in the maintenance of an industrial microwave system and that it is far cheaper to employ tubes, which are oversize and draw more power, but can coast along on their job for long periods of time without replacement. Few engineers realize that by saving three dollars on a tube he might cause the user several maintenance calls each year at $25 a visit.

They do not know these things; it is up to industrial customers to tell them. It is natural for a manufacturer engineer to design a radio system with the maximum of radio equipment and a minimum of outside plant. This in some cases penalizes the customer. Many times it is to the customers advantage to invest his money in higher towers with longer distances between stations than cheaper but shorter towers which would result in more relay stations. The least expensive part of an industrial microwave system is the radio equipment; the expensive things are towers, surveying, and the long term cost of servicing a multiplicity of stations.

Axiom 1—*The fewer stations the better, almost regardless of tower height.*

It must be clearly explained to the manufacturer that the purchase of a microwave system is like buying a horse—it is not the first cost but the upkeep. And the excessive upkeep is not involved with cost of tubes and parts; it is purely and simply labor consisting of time and transportation cost.

There are a lot of maintenance calls involved over a ten-year operating period of a system.

Axiom 2—*Anything in equipment design that will reduce the frequency of maintenance calls is well worth while, regardless of electrical efficiency of the unit, and to an extent regardless of initial cost.*

There has been a great deal of discussion concerning the rigidity of microwave towers and antennas. The manufacturers have indicated that the azimuth weave should be almost nil in a 100 mph wind, or the system won't work and their performance guaranty is void. This is a problem on 6000 megacycles. But on the lower frequencies, if the system is designed for sufficient fade margin there will be no stability or azimuth weave problem, as long as the tower will not blow down. If there is no wind, fading may occur. Every reserve of fade margin will be required, and loss of energy from off-path deflection of the antenna would be disastrous. But at the same time under this calm wind condition the tower will not weave and no harm will be done. In other words if there is sufficient wind to wobble the tower, it will also break up ducting effects, and the one-half power point, which is only 3 decibels, is negligible compared to a 30 decibel built-in safety fade margin. The reflector could twist sufficiently to reduce the on-path signal to much less the half power point and still maintain communication.

Axiom 3—*If the tower won't blow down, it is rigid enough.*

The ideal radio relay station does not require a tower, nor a building, nor a site, nor access roads. The ideal relay station is, of course, no station. However, if the evil is required, it should be as simple as possible; let us start out with the absolute minimum, in this case no station, and work slowly from there. Starting on towers: If you must have a high tower for path clearance you might as well go whole hog and erect a sturdy one. But first make sure the height is actually needed. And make sure, especially in

the shorter towers, that it is not over designed. From a permanence standpoint, either you expect hurricane winds and design for it, or you plan to have no such storms at that site and use a lighter structure. Tornados can be ignored in design, either they hit the tower or they don't, and one cannot afford to build for them. Tower lighting is important, but apparently no one has emphasized the fact that it is better to spend $3 for a small lamp that will last two years than $1 for a lamp that will last one year. What is needed is a two year plus lamp, regardless of cost; to be changed on routine once a year. The necessity for tower light burnout alarms on the microwave system can be eliminated and at the same time reduce the number of relays and gadgets required.

Axiom 4—*Many times it is simpler, and from a public relations standpoint better, to have a local observer to report tower light failures in to headquarters.*

And there is an extra dividend in this method, if a local resident or farmer is available. These people, usually of great integrity, take pride in this duty and often act as self-appointed guardian of the station involved.

From towers you look at buildings. Again one comes back to the theme: the best building is no building. If there must be a building, it is of little value unless it is dustproof and is ventilated by the pressure method using intake fans sucking through a good filter. But for simple radio relay stations, is a building needed?

The radio equipment must not be a marginal performer. If great pains must be taken to provide commercial power voltage and frequency stabilization then the design is no good for rough and ready service. The radio equipment must perform and maintain communication even if the commercial power voltage varies 15 volts plus or minus and the frequency varies from 50 to 70 cycles. This sounds like a large order, but it can be done. The advantage of the equipment being non-frequency conscious is of tremendous importance if standby electric generating plants are employed.

Axiom 5—*If you lose communication when your commercial power fails, the radio equipment design is no good.*

While on the subject of power, one should emphasize the fact that the stand-by generators must be designed so that the air cooling inlet brings in air from the outside and not from inside the building, and even more important, the hot exhaust air must be easily ducted to the outside of the building and not inside. The most important thing the stand-by generator must do is simply to start. This is not as easy as it sounds. Experience has pointed out the difficulties in the use of gasoline as fuel, after several months of storage gums are formed as a product of oxidation and the more volatile components are lost by the process of weathering. There is always a problem to keep it in the carburetor for quick starting, and it gums up the engine. The remedy is to fuel the prime mover with gas, either natural or bottled.

The electric utility companies do not house their outdoor substations in elaborate buildings, and careful design will in many cases eliminate the necessity of such structures for radio use. The radio equipment can be mounted on outriggers bolted to the tower; and the stand-by generator, if any, can be mounted on the concrete tower base, which is extended slightly in the form of an apron in the desired direction. If this is done, there is no problem of ventilation nor heat nor vibration. It means that there is just one trip by physical plant installation crews; they move in, erect the tower with the extended apron slab, and do not come back.

Axiom 6—*Do not come back to the job—design so that each crew complete their work in one trip to the site.*

Transportation is expensive, and careful planning will bring out the wisdom of the wartime cliche, "Is this trip necessary?"

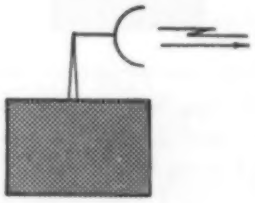
There is not much you can do about access roads except that they must be built to last a long time and must be properly drained.

Axiom 7—*If the radio path design forces a site requiring an access road, make it a good one.*

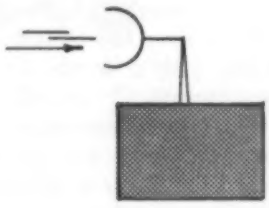
It is realized that all will not agree with the design philosophy outlined above; it has been presented largely in an effort to stir up constructive thinking by both manufacturer and user of such equipment. To help in this effort, the writer has some definite ideas which are offered as a stimuli for further study by all parties concerned. Here they are:

The goal is a functional microwave system with reasonable cross-talk ratio which will never require maintenance, use a minimum of stations with higher towers, or more stations with smaller towers or telephone poles or even fence posts, without expensive buildings, and which will be reliable and keep functioning under all conditions.

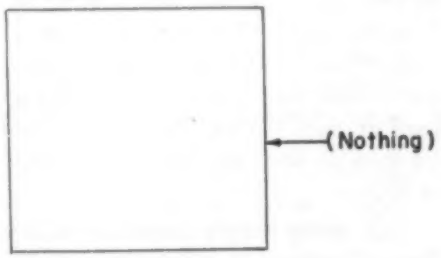
The philosophy of tower and building and a standby power design has been outlined. That leaves one thing: The Little Black Box. The ideal radio transmitter will look like this . . .



• The ideal radio receiver will look like this . . .



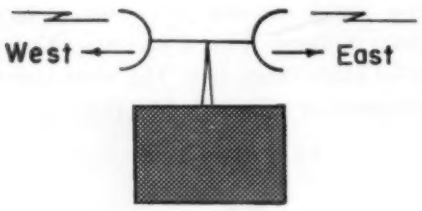
• The ideal collection of gadgetry will look like this . . .



• All of the transmitter black boxes in a system will be identical, some

being fixed tuned to the East Bound Frequency and others to the West Bound Frequency; like this . . .

• If one wishes to further simplify, and if the system does not use pulse type modulation you can come up with this . . .



In this case one transmitter sends both east and west with equal power. East and west bound intelligence is transmitted in the form of sub-carriers, with one sub-carrier frequency picked off by the receiving station to the west and the other by the station to the east. The transmitter is simple but rugged. It would operate in the 960 or 2000 megacycle band, and would use a long life oscillator tube in a cavity, with a simple automatic frequency control or crystal control circuit. The CW power output would be at least 5 watts or if pulsed, 50 watts peak. The tubes should operate for a minimum of three years before requiring replacement.

The transmitter, an independent unit, will receive power from another black box, a heavy-duty long-life power supply which would provide from one master DC rectifier the several voltages required by the various transmitter and receiver black boxes used at each station. There would be no fuses to burn out—either it works or it doesn't.

This power supply would resemble the utility company power transformer and if tubes are used, they should be designed for a minimum three years continuous duty. There would be no radio standby equipment as such, and no complicated sensing and switch-over circuits. Either the set works or it doesn't.

If, because of supervisory control or other functions carried on the system no outage time can be tolerated even for the infrequent changing of tubes, then two transmitters are operated in parallel, designed so that either of them would provide half the transmitted power under "no fade" conditions, and in this case tubes may be changed and other tests made without interrupting the circuit. If dual transmitters are used, of course they must be modulated from a common source. Radio standby equipment is more trouble than it is worth if purchased as a preventative for "trouble" circuit outages. Its only value, and it is a decided value, is to permit maintenance work without circuit interruption.

This equipment should be narrow band, and there is good reason to believe that the old modulation technique of AM (amplitude modulation) should be used. No attempt would be made for multiplexing. The equipment should be designed for one voice channel plus possibly ten telemetering or supervisory control functions. It should compete in cost directly with one leased wire common carrier channel. If more than one voice channel is desired, another set of transmitters and receivers could be installed on another frequency. In other words, this simple system would compete with common carrier circuits on equal status, circuit by circuit.

These black boxes could be interchangeable, and the maintenance man would carry with him one or more spare units which can be plugged in the system while repairing the defective unit. It will be noted that all the boxes are of plug-in construction, similar to aircraft radio design. Ordinarily he would carry with him:

1 "East" Black Box

1 "West" Black Box

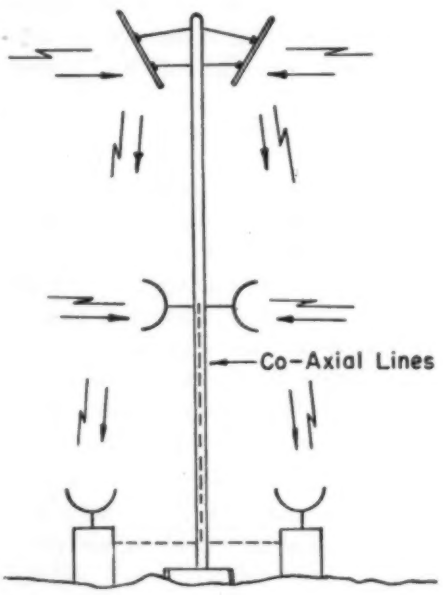
1 Power Supply Black Box

1 "Terminal" Black Box

The "Terminal" Black Box will contain the radio-to-telephone terminal equipment to connect the radio links with the telephone handsets, telemetering apparatus, etc.

If standby receivers are employed, they should serve as 100 percent standby, not 50 percent, and should be in the form of diversity receivers to reduce fading. There should be no complete receiver switching, as now employed; either the deluxe model installation with diversity reception will be used, or no "standby" at all.

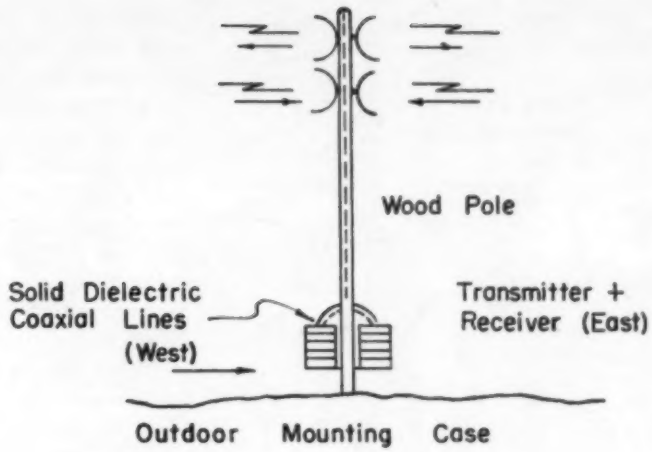
It follows that if diversity reception is used, two receiving antennas are required, and this not as complicated as it sounds if the following arrangement is used:



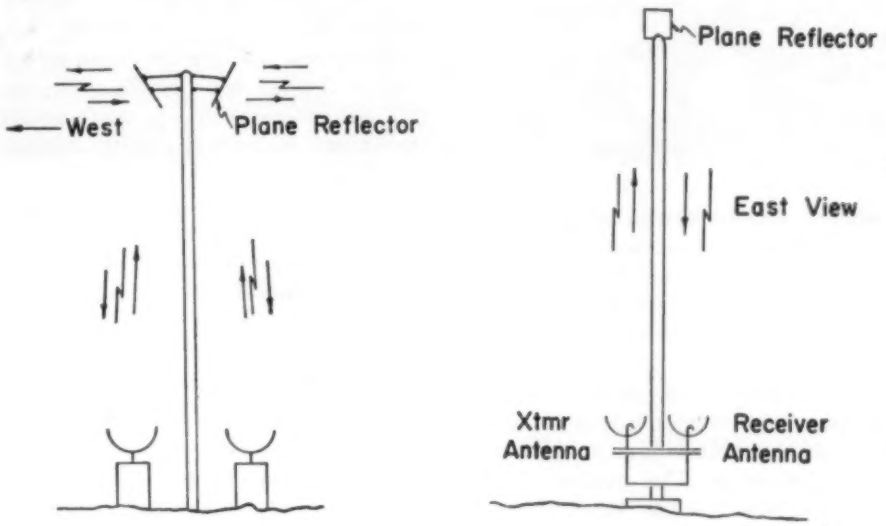
If you are not adverse to several reflectors and/or antennas, you can further eliminate precisely adjusted gadgets and do away with the antenna duplexer and its inherent problems. You need all the power you can get; you can save the cost of the duplexers and invest it in separate antennas for transmitting and receiving.

Continued on Page 51

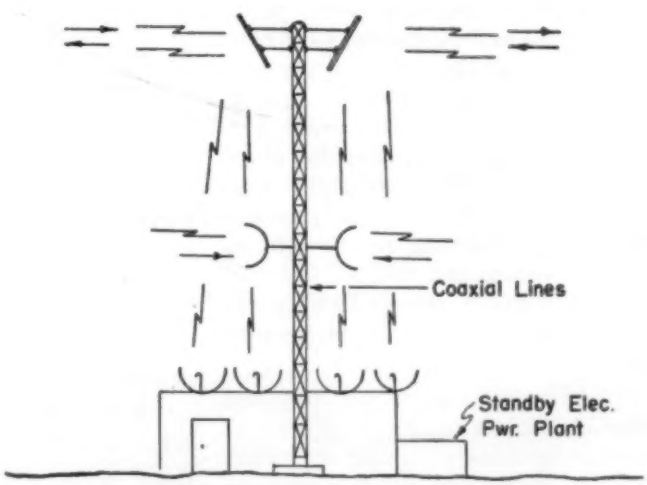
• The antenna layout for a lower cost relay station would look like this . . .



• If higher towers are required it will look like this . . .



• If the "deluxe" station is indicated, then you can go whole hog with double transmitters and diversity reception like this . . .



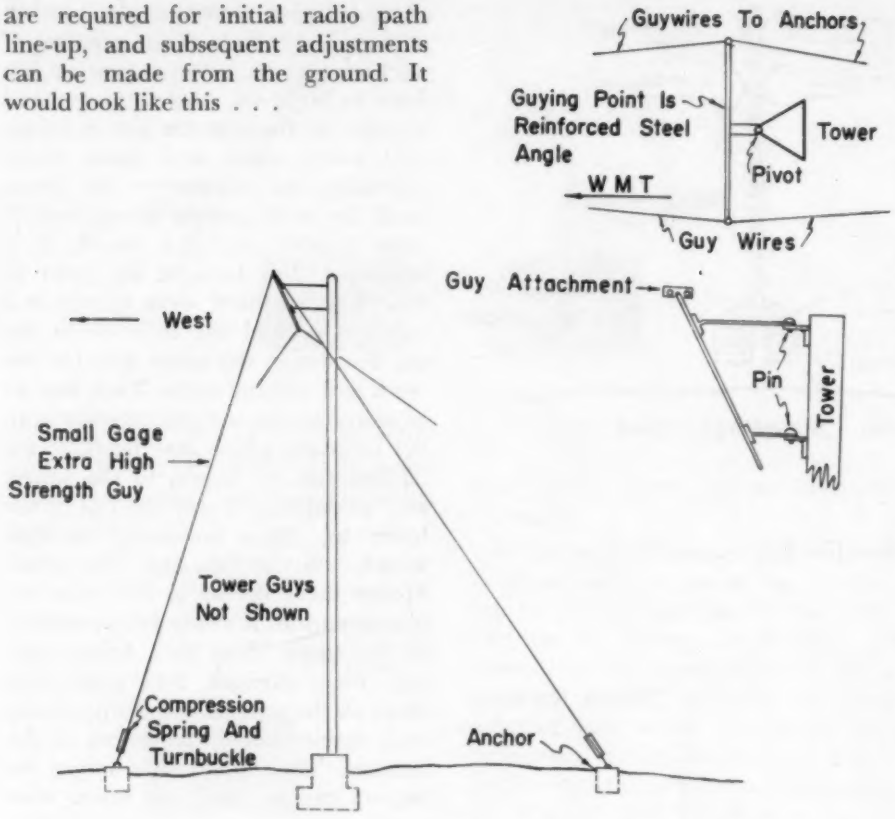
Building Contains Dual Transmitters & Dual Each Direction. The Dual Receivers Are Arranged For Space Diversity Reception Or Frequency Diversity As Required.

With higher towers, if plane reflectors are used, there is the problem of anchoring them. Previous practice has been to build the tower stronger and stronger as the reflector size increases, and worry more and more about rigidizing the reflector to the tower until the point arrives at which it is more trouble than it is worth. It is suggested that thought be given to this: Let the tower serve merely as a support to hold the reflector in the air, but design the tower only for this work and nothing more. Then instead of worrying about rigid supports from the reflector, which may be 10 feet x 20 feet size, or larger, to the tower, and attempting to guy the top of the tower to reduce horizontal azimuth weave, you can take the other road. Mount the reflector to the tower on pivots, and let it swing independently of the tower. You then bring four-way high strength thin gage guys down to the ground and anchor them with spring-loaded connectors to the anchors. This means that larger reflectors can be used, no tower men

About the Author

F. VINTON LONG, born and educated in Florida, started in communications at the age of 8 and was at 12 the youngest licensed radio amateur in the U. S. His experience includes seven years with Pan American Airways, six years with Mene Grande Oil Company of Venezuela (communications superintendent), three years as AAF communications officer and three years as special representative of Westinghouse International and Wilcox Electric concentrating on the design and sale of Overseas Airways Communication Systems. He joined Texas Eastern Transmission Corporation, Shreveport, La., in 1950 and is in charge of the design and construction of several microwave and VHF communication systems.

are required for initial radio path line-up, and subsequent adjustments can be made from the ground. It would look like this . . .



All of the above assumes that the equipment will never fail. This will not quite be true. If, for certain "deluxe" systems, you wish alarm circuitry to be installed, use the simplest most fool-proof type available to the average user, it does not matter just which part of his equipment at a station has failed, either the station is operative and does not require a service call, or it has failed and it does. Therefore simple "failsafe" type alarms should be used, possibly one tone from each station, which is on continuously and holds up a relay and lights a bulb at the alarm receiving point. If the lights are all burning, all is well, and if some are out the service engineer can easily tell which stations are operating and where the trouble shows.

One can say this is too simple and all troubles cannot be readily localized. This is true but it is also true of the most elaborate and complicated system of alarm. If the component parts of the radio equipment are selected as the very best heavy duty units available, and the size of the resistors and the condensors is such that they will loaf on the job, there should be little difficulty in "building in" long life and reliability. The same solution cannot be obtained so easily in the selection of tubes and that is why you might like to do away with all of them and use transistors. That the tube manufacturers are aware of this problem is indicated by the words of a prominent tube engineer and we quote:

"As engineers, one of our most important requirements is that we maintain an open mind on all subjects that come before us. The matter of tube reliability has been so very badly misinterpreted, misreported, and lastly misrepresented, that for one to take any position other than that which is generally conceded to be the popular one, seems little short of foolhardy. This company has, however, continually taken the stand, not only with its customers, but more frequently with the military planners, that the whole subject of equipment reliability had been grossly and maliciously oversimplified by permitting the thought to become widespread that all one had to do to improve system reliability was to improve the reliability of vacuum tubes.

"Before one can even enter into the very elementary phases of this discussion, it becomes extremely important that one define reliability." It becomes immediately apparent on even a superficial investigation of this subject, that no two major services, or activities, have the same fundamental interpretation of reliability. Reliability may mean ruggedness; it may mean extremely close tolerances on characteristics or initial tubes; it may mean long life without catastrophic failure; it may mean long life with only nominal shift in characteristics; it may mean an extremely low statistical occurrence of initial failures; it may mean continued operation under very detrimental environmental conditions. Upon closer study, it becomes apparent also that many of the reliability factors are in complete opposition with one another, and it soon becomes obvious even to one completely inexperienced in the physics of therminonic devices, that to attempt to include all of the reliability factors into one device becomes utterly ridiculous.

"The above statements are made in preparation, and as a background against which one may interpret the engineering position taken by this company on the matter of so-called "reliable" tubes. We feel that it would be just as reasonable to attempt to define the universal tube which would be suitable for all applications as it is to attempt to define a reliable tube, one which is universally reliable or rugged, or will give long life in any socket for which its prototype was designed. We do not feel that any company can properly describe its product as being reliable, rugged, long life or give any other such general treatment to the problem without being very specific about the precise conditions under which this reliability can be expected. To the best of our knowledge, no such information about the limitations that must inevitably surround any such tubes, if we are to be at all realistic, is given out by anyone claiming to have such a line of reliable tubes."

So it comes down to the use of as few tubes as possible, and to keep them working way under their ultimate power. The industry requires 1925 broadcast transmitter type construction, with big tubes that loaf along on their job. The tubes and components should be designed as the common carriers build their deep sea cable underwater equipment, to last for 20 years without replacement. The manufacturers can certainly accomplish anything they set the target for. and industrial customers can certainly help them. —**The End**

George L. Chapman, Wolverine attendant at Hammond, Indiana, transmits pipeline operations data to New York over a Bell System teletypewriter circuit

"Bell System furnishes us dependable communications at a price we can't equal"

—says Cyrus S. Gentry, President of the Wolverine Pipe Line Co.

Flexible, low-cost communications is what Wolverine Pipe Line Company is getting by renting private line teletypewriter service from the Bell System.

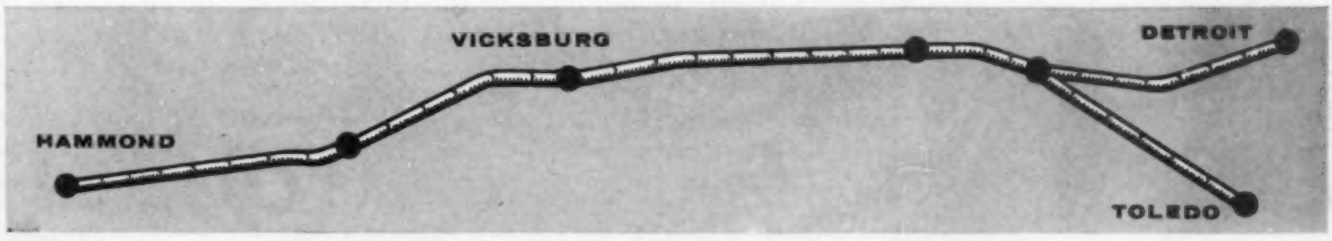
From Hammond, Indiana, products are started along the 295 miles of 16-inch pipe line to Detroit and Toledo. By using a Bell System teletypewriter circuit the operator starts or stops the big high-pressure pump at Vicksburg, 125 miles away.

Hundreds of miles east in New York, a dispatcher keeps round-the-clock watch over the Wolverine Pipe Line's seven stations. He gets reports and sends orders over Bell System teletypewriters.

"The expense of a privately owned system would be far in excess of a rented circuit," says a Wolverine official.

To find out how your communications efficiency could be improved, and costs lowered by using Bell System service, ask your Bell Telephone representative.

BELL TELEPHONE SYSTEM



For more data on advertised products, use Readers' Service Cards, last page.

How to Give Orders

Here are some ideas for all pipeliners who direct others . . . station superintendents, repair foremen, operators and engineers.

By AUREN URIS,
Research Institute of America, New York City

"GEORGE, RAISE the station pressure."

"Yes, sir. Suction or discharge."

Now there is one superintendent who doesn't have to worry about his orders—as long as the alert George is at the receiving end.

It's not what you do, but how well your subordinates respond to what you tell them to do that determines your effectiveness as an executive.

Granted, that order-giving is one of the ABC aspects of executive activity. Nevertheless, it's worth while to look into the subject to make sure that the story of your executive life isn't marred by the confusion and frustration of orders gone sour.

And while we're on the subject of ABC's: a typewriter can tell you a great deal about the process of order-giving:

You look at the machine, and each key is clearly identified. If you tap the first key at the left of the bottom row—the "order" to perform—the letter *z* will obediently appear on your sheet of paper. If you modify your order—push down the shift key—you'll get a changed result: *Z* will appear.

With the typewriter, you know exactly where you stand. You know, for certain, that particular "orders" will get you specific results.

Giving orders to human beings is somewhat the same—except that there's no standard keyboard: The order that will result in Miss A bringing you the letter you want would bring Miss B back after ten minutes, telling you, "I can't seem to find it. Did you mean the D. G. Smith letter about our incorrect billing, or the A. D. Smythe letter requesting information about our community relations policy?"

Since an executive operates largely through others, his order-giving practices act as a bridge between plan and action. To activate your people satisfactorily, you've got to prepare, phrase and deliver orders with an eye to a number of situational factors.

Basically, your order-giving activity clusters around three major points:

1. Preparing the Order—To be able to do the job you have in mind, an order must have:

An objective. According to one simple definition, an order "is an instruction for someone to do something." The something is the goal to be reached, and must be made clear by the order as you give it.

Direction. The person to whom the order is addressed should, upon proper carrying out of the order, find himself logically and inevitably at the desired goal.

Practicality. The instructions must not include either directly or by implication any act or deed which the person is incapable of performing.

With the common garden variety of order, of which you give dozens every day, you almost automatically take care of these preconditions. It is when orders become more complicated, however, that the omission of one or more of the above elements lead to failure.

2. Selecting the Person—In many cases the successful outcome of your order depends entirely on the person you select to carry it out. Certain orders, in fact, cannot be given at all—even though their objective is extremely important—because the right person to do the job is not available.

Consider the celebrated historical incident of the "Message to Garcia." It was only when the officers of the U. S. Military Intelligence were able to find a man sufficiently qualified for the task—Lieutenant Andrew Somers Rowan—that contact with General Calixto Garcia could be made.

In the average case you can make your selection on one simple point—who is available to act on the order? That is satisfactory when no unusual skills are required. But sometimes the problem is less simple, and in such cases you have to take additional points into consideration:

. . . Who is most available?

. . . Who is in line to do the job?

. . . Who will best understand what is to be done?

. . . Who will be most cooperative—or have the greatest drive to carry out the order?

. . . Who is capable of the best performance?

There may be positive one-word answers to all these questions, and when there are, you are in the clear. But frequently even these simple questions pose tough problems:

It is possible, for example, that the person most available to carry out your instructions may not be the person in line to do so.

Let's say you want a record made up of all the business contacts with a customer company. The assistant on whom you have depended for this type of assignment is tied up elsewhere. Another man capable of doing the job is available. Should you assign the second man?

Of course it depends in part on whether there is time pressure on the assignment, how long the "regular" man will be tied up, whether the substitute can really do the job to the standard that you require.

But before you decide, you've got to think over questions like these: Does the man on whom you usually depend for this kind of assignment think of it as "his" job? Will you set up an antagonism between the two subordinates by pulling a switch on previous practices?

The person you pick will largely depend on the emphasis the situation gives to the list of questions above. If, for example, the question of the quality of performance is paramount, you may cast all considerations aside,

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The S&J Pilot Operated Safety Valve, Fig. ST-5000, incorporates a special seal on the main valve pallet preventing any leakage prior to full opening. It operates exactly at the set pressure with a minimum of blowdown, requiring no accumulation of pressure above this setting for full opening. A special "peeling action" on valve seating surfaces minimizes interference by freezing or sticky foreign substances. Should the diaphragms be damaged or ruptured, the valve will continue to operate at a lower pressure. Available in 4" and 6" sizes for pressure ranges of 1 to 10 pounds.

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make sure that your best man gets the assignment.

Reason for Your Choice—It often helps to tell a subordinate why he has been selected to carry out the order. Sometimes the explanation gives you the chance for personal praise: "I am asking you to handle the job because of your experience with this kind of situation."

Generally, you must single out an individual to have your instructions carried out. The request "Will somebody please . . . " is unlikely to enlist much assistance.

Occasionally there may some doubt as to the person who should draw a particular assignment, but often there is no doubt as to who should not.

For example, you have to avoid making one of your subordinates a work-horse. It is a pitfall many executives fail to sidestep. There are two usual reasons behind this practice:

- There is a natural tendency to avoid giving orders to people whose response is negative—either apathetic or reluctant.
- There is an opposite tendency to overload the willing and cooperative employe with the montonous, difficult or unwanted job.

It is both unfair and unwise to select the recipients of your orders on such a basis. Eventually there is bound to be a kickback: the constant target of your order-giving suggests in more or less forthright language that you stop trying to break his back. Or, bewilderingly, the individual who has made his reluctance clear in any one of a number of ways will abruptly inform you that you have been playing favorites by neglecting him in your assignment-giving.

3. The Delivery—There is no single right way to give instructions. What is right in one situation may be wrong in another. What is right for one person may be completely ineffective for another.

As a matter of fact, the simple matter of wordage can vary almost from zero to infinity. Consider these two examples:

Dr. Robert N. Wilson in the magazine *Human Organization* describes the order-giving process in the amphitheatre of the typical operating room.

"The individuals composing an (surgical) operating team are so close-knit and understand their tech-

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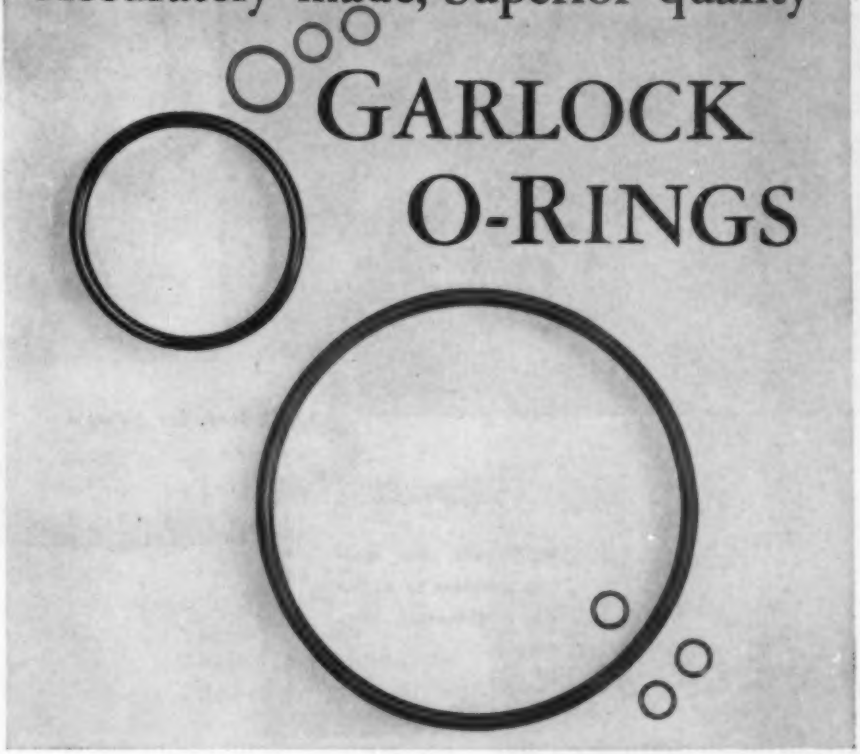

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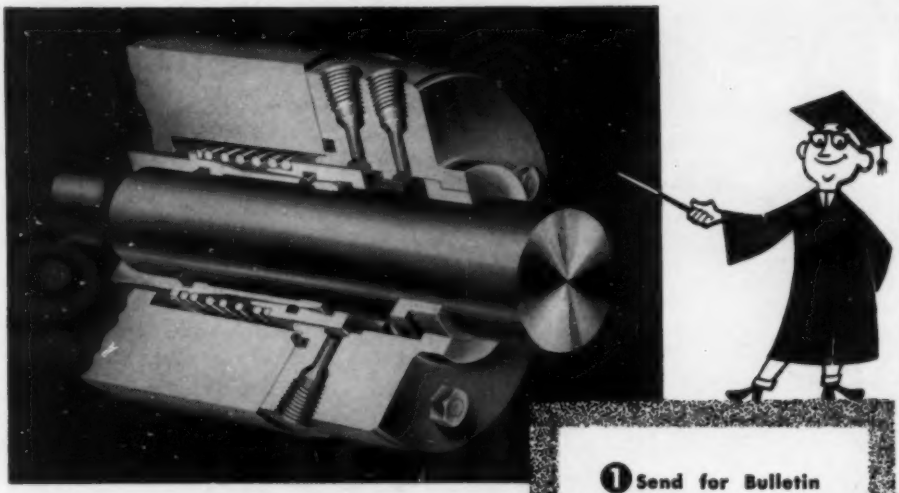

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nique so thoroughly that verbal signals are often unnecessary."

And at the other end of the scale are the instructions developed for the vast military maneuver known as the invasion of Normandy in World War II. It is said that the written documents alone for this move would fill a room 6 cubic feet square.

His Point of View — Summer boarder: "What a beautiful view!"

Farmer: "If you had to plow that view, harrow it, cultivate it, hoe it, mow it, fence it and pay taxes on it, it might look darned ornery."

You think of an assignment from an entirely different viewpoint than your subordinates. To you the order is the means to an end to which you are thoroughly dedicated. To a subordinate the activity posed by an order may be an unpleasant work.

You may not always be able to build in an incentive or an interest-catcher in your order. Face the fact that some tasks are monotonous and dull. But once you have made this concession to reality, you are in a better position to understand the possible attitude with which your orders are received and to act accordingly. "Accordingly" in this case means that the order itself as you phrase it and deliver it should add the greatest possible impetus to its being carried out successfully. At the very least, it should pose no obstacle.

Clarity—It may sound implausible, but this actually happened in a Pennsylvania plant:

A company manufacturing radio tubes uses welded racks for transporting trays of parts from one department to another. These racks are called busses, and all personnel speak of "moving a bus," "putting trays on the bus," and so on.

Recently a large group of employes were hired. At the end of the first day, a supervisor told one of the new girls to put her trays on the bus. At the end of her shift the willing but bewildered girl proceeded to take several of the trays, more than she could comfortably carry, out to the corner bus-stop and attempted to load them aboard.

Unless you're sure of your people, don't take their knowledge for granted. Particularly where technical or trade terms are concerned, it pays to see if they really know what you're talking about.

In short, orders often misfire because the executive erroneously as-

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HOT DOPE

Straight from the Kettle on PIPE PROTECTION

★

By Boyd Mayes

Years ago I fell victim to a suit of clothes that was so cheap it seemed unbelievable. The suits looked okay in the window and the salesman really gave me a good pitch on how much money I was saving. Since I'm not allergic to saving a few dollars, I bought that suit. I wore it just a few times. It never did look right and it fit worse. Every time I looked at that suit hanging in the closet I got mad, so I finally gave it away. Since I still needed a suit, I went to a store that didn't advertise price but pushed quality. Sure, I paid more, but I bought myself a suit that got me a few compliments and wore for years—at a price that was actually reasonable for what I got.

My experience reminded me of what John Ruskin said a long time ago: "It's unwise to pay too much, but it's still worse to pay too little. When you pay too much you lose a little money—that is all. When you pay too little you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do." (I learned the hard way.) Ole Ruskin went on with this gem: "... business prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

Whether it's clothes or pipe—the principle is the same. For over a quarter of a century we've been coating and wrapping pipe to last—"PUTTING PERMANENCE IN PIPE"—and that's what makes our service most reasonable in the long run.

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sumes that a subordinate has certain knowledge.

Frequently this assumption seems perfectly well founded. Suppose you tell a new stenographer: "Make three copies." In the office where she worked before three copies meant an original and two carbons. You are safe, however, if you define your terms in giving the order: "Make three copies — an original and two carbons."

Check for Understanding—General Grant is said to have retained an incompetent officer on his staff for a single purpose: "If he can understand my orders, anyone can," explained Grant. You may not be able to keep such bell-wethers in your office to test the intelligibility of your orders, but you have other means available.

Any doubt you have about whether you have been understood could be resolved by methods like these:

- Get your subordinate to repeat your instructions.
- If you feel you may offend him you may check indirectly by asking: "How do you plan to go about it?"

Spell it Out—The clarity of your orders depends on their completeness. The test is not what you would have to be told to carry out the assignment but what he has to know. How much detail you give is determined by the individual.

Your most effective orders are usually those given to people you know well. If you don't know the man you're dealing with, the order must be much more detailed to make sure that you're not overlooking anything.

Fitting your order to the individual requires that you know three basic facts about him:

- **His training and experience.** You can dash off a quick order to an old standby in your department without danger. "Check this for errors" is enough because you know his background and know the work he has done before.
- **His judgment.** "If it gets too hot, let the office force take the day off," you direct an assistant. One person may be able to judge without any difficulty. Another may not have that particular type of judgment. It's safer to tell him, "When the thermometer hits 85, send them home."
- **His initiative.** You can tell one individual, "Joe, get Mr. Brown to

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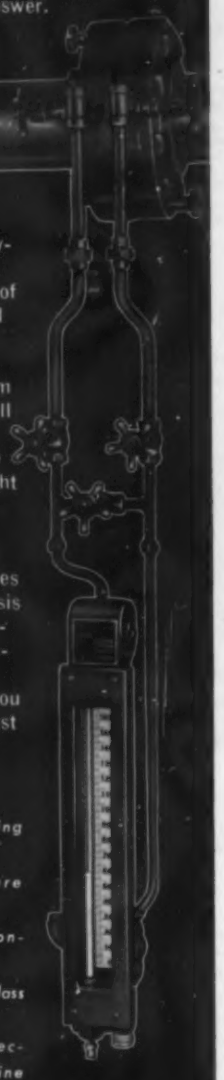

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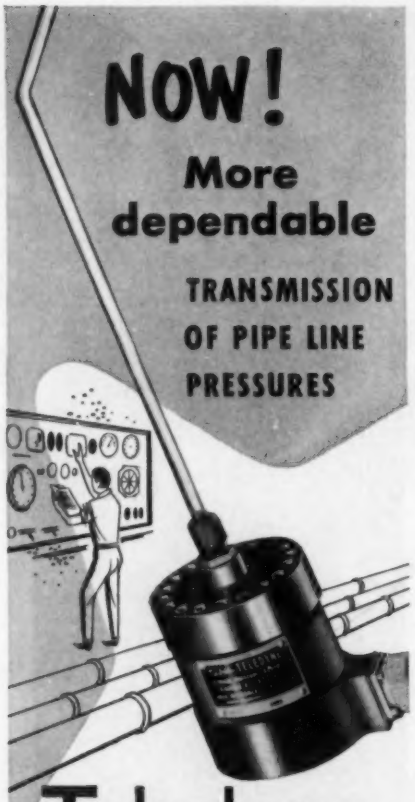

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send over a 2-Y model immediately." He knows who Brown is but doesn't know where he's stationed, so 15 minutes are spent while Joe wanders around asking people where he can find Brown. But give exactly the same order to Harry, who doesn't know Brown, and five minutes later you have the item you're after. Harry just picked up the phone and let the switchboard find Brown for him.

One man displays initiative and originality, the other doesn't. To make the order to Joe effective, you have to tell him: "Get Brown on the phone and ask him, etc."

Trouble Shooting—It pays once in a while to check back on your order-giving technique for weak points, if any. Here is a brief check list that may help you pinpoint some of the underlying causes of activation that fails to give a fully satisfactory result.

1. **Preparation.**

(1) Are you clear on the facts that will give your order—
- . . . an objective;
- . . . direction;
- . . . practical result?

(2) Do you make sure that the situation as you have it in mind will coincide with what your subordinate finds when he starts to carry out your order?

2. **Picking the Person.**

All other things being equal, do you give your orders to the subordinate who—
- . . . is most available;
- . . . is in line for the assignment;
- . . . will best understand what is to be done;
- . . . will be most cooperative or have the greatest drive to carry out the order;
- . . . is capable of the best performance?

3. **Delivery.**

(a) Do you dish up orders to the people in your work group in bite-size, digestible portions?

(b) Do you get power into your orders by delivering them with clarity, calmness and self-confidence?

(c) Do you keep your orders fresh in their minds by using "boosters"—the repeated shots-in-the-arm that help focus attention such as—
- . . . reviving their interest;
- . . . teaming them up in effective groups;
- . . . emphasizing the goals?

(d) To make your orders stick in general, do you—
- . . . pin down responsibility?
- . . . insist on follow-through?
- . . . fill in for those who require all the details?

(e) Do you check progress, either by personal inspection or by having subordinates report back to you?

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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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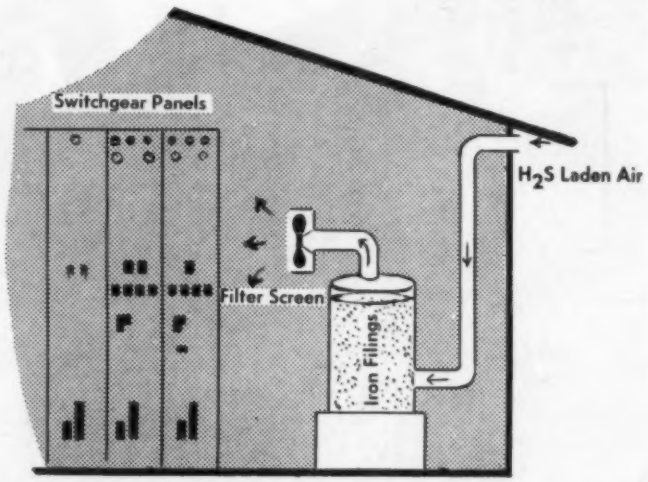
How to do it

PIPE LINE HINTS

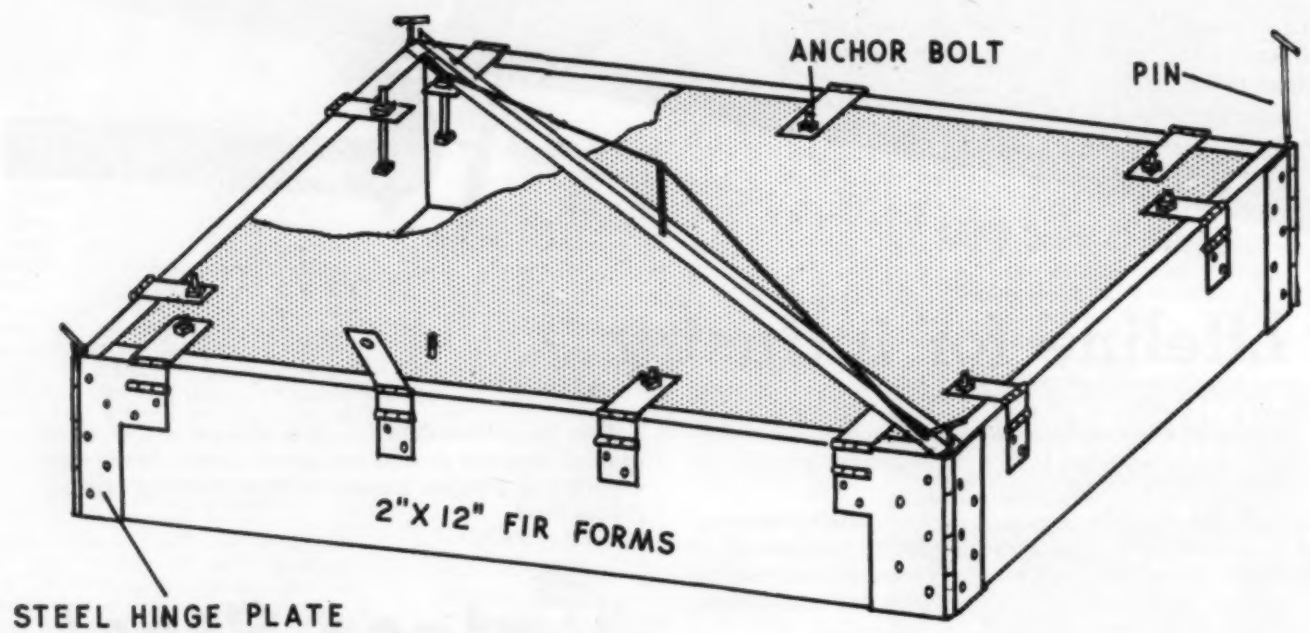
$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

Protect Switchgear From H_2S in Air



Silver contact points of switchgear can be protected from hydrogen sulfide fumes in air by using an inexpensive filter-reactor. Ventilating air is drawn over a bed of fine iron filings packed in an oil drum. The corrosive H_2S gas reacts with the iron filings and clean air passes through a filter screen into the control room.

The fan maintains a slight positive pressure inside the control room to keep hydrogen sulfide-laden air from entering through cracks.

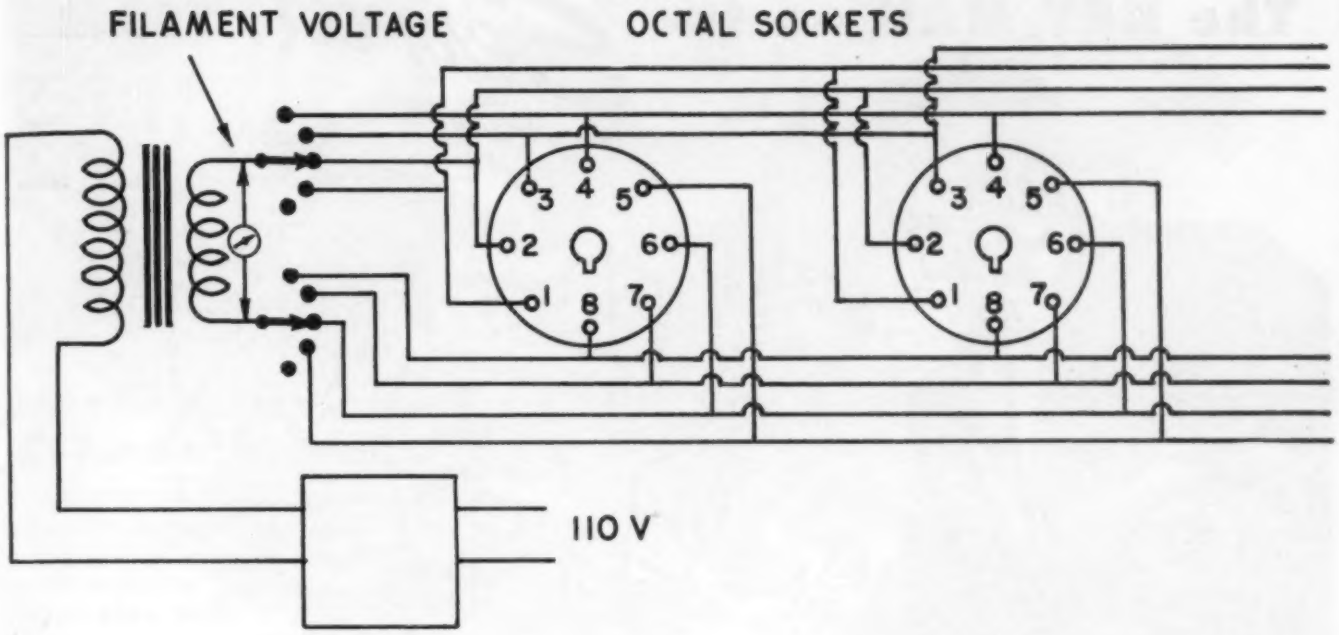


Durable Form for Meter Building Slabs Saves Money

A simple form saves $75 to $100 in pouring concrete slabs for meter buildings. The form is made of fir, hinged at the corners. A squaring bar holds the form rigid until the concrete sets. Corners are hinged with half-inch rod slipped through four pieces of half-inch pipe. Pieces of pipe are cut in varied lengths so that the sides can be put together in only one way.

Bolt jigs are double hinged as shown. This allows the hinges to be folded out of the way when the concrete is being struck off. Hinges fold back flat for neat stacking and hauling.

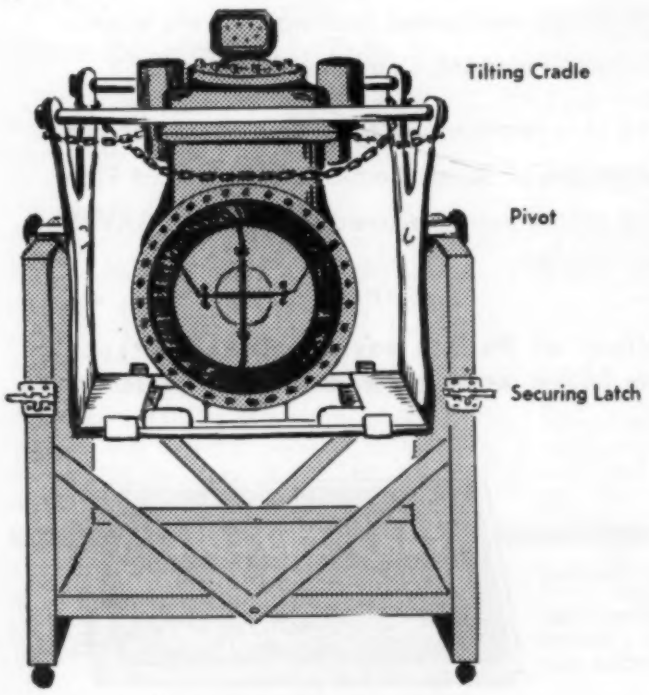
Forms are saturated with oil prior to use to preserve the wood and to prevent concrete from sticking. Some forms have been used over 50 times and are still in good condition.



Panel for Burning-in Tubes Cuts Electronic Upkeep

Circuits for burning-in tubes for electronic equipment will save trouble-shooting time and expense. The most critical period in the life of a tube, its first 24-hours, may be safely spent on this panel. Radio equipment maintenance costs can thus be reduced.

Any practical number of octal sockets may be used in this setup. Voltage from a variable transformer is supplied to the filament through the two selector switches at left which permit the filament to be energized. Obviously, only one kind of tube can be burned-in at a time.



Meter Repair Stand Has Safety Features

A shop-built meter repair stand will save time and provide safety in the handling of heavy meters. The stand is constructed to handle several sizes of large positive displacement meters.

Use of a pivoted cradle permits the meter to be tilted to various positions so that a repairman easily can reach all parts of the meter. Securing latches fasten the cradle in the desired working position. Chain lashing steadies the meter while it is being moved or repaired.

The stand is equipped with casters so meters may be moved about the shop. Use of the stand not only speeds repair, but reduces lifting and handling of the heavy meters, as well.

The KEY MAN on the *Service* TEAM

He Offers You a Specialized SERVICE

He is YOUR Salesman – Serviceman who heads a SERVICE TEAM of Underwriters, Safety Engineers, Auditors and Claimsmen. Each member of this team brings specialized training and experience to YOUR Workmen's Compensation needs.

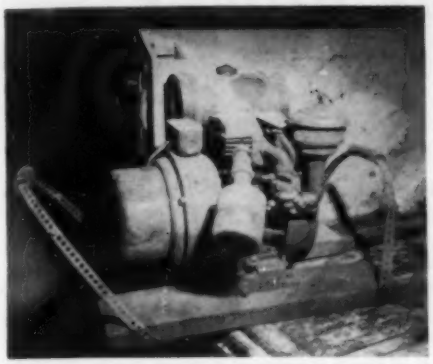
Have this team work for YOU. Find out the advantages of Texas Employers' Net Cost Plan which offers you improved service and SAVES YOU MONEY.

Millions of Dollars saved policyholders by Texas largest writer of Workmen's Compensation.

HOMER R. MITCHELL, *Chairman of the Board* A. F. ALLEN, *President*

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI • DALLAS • EL PASO FORT WORTH • FREEPORT • GALVESTON • HARLINGEN • HOUSTON • LUBBOCK • MIDLAND ODESSA • PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE · DALLAS, TEXAS

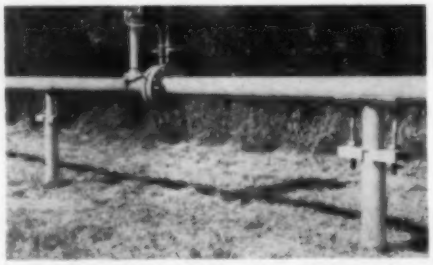


Make Metal Strip Handles For Portable Light Plant

Metal strip handles can make shifts of a light plant around pipe line construction jobs easier.

To make the handles, cut perforated metal strips to the desired length and cover with a length of rubber hose for a grip. Bolt the ends of the strips to the plant base as shown.

This simple device can save smashed fingers and back-bending.

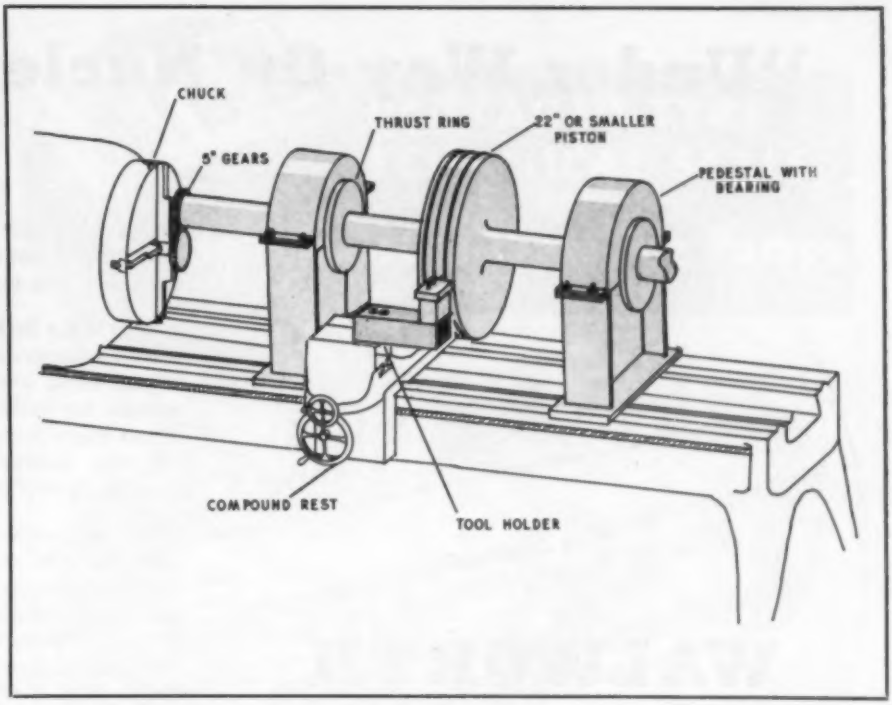


Telescoping Supports Make Leveling Run Easy

Installing inexpensive adjustable pipe supports on each side of an orifice meter make it easy to level the run.

Supports are made from four-inch pipe set in concrete. Inside this four-inch is an adjustable three-inch nipple with a pipe saddle on top. These saddles support the meter run. Two ¾-inch bolts are welded to the bottom of each saddle. Double nuts on these bolts transfer the weight of the run to the brackets welded to the four-inch support as shown. They adjust to the correct height to level the line.

A meter man checks the run with a level when he is reading the meter and makes quick adjustments when necessary.



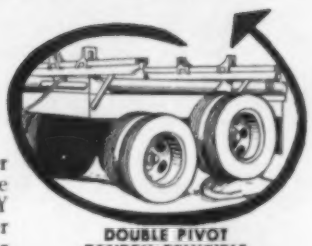
Adapt Lathe to Regroove Larger Piston

A lathe may be adapted to regroove power pistons larger than its rated size by using a shop-made jig. It eliminates time and cost of shipping pistons to outside shops.

To adapt a lathe for the large pis-

TOP QUALITY PIPELINE TRAILER

THE LOADCRAFT
PIPELINER



DOUBLE PIVOT TANDEM PRINCIPLE

At last here's a top-quality tandem trailer for the pipeline industry that is really built to take the cross-country hikes. The axles will STAY in alignment. Quality that has made Spencer Trailers popular with the oil fraternity for over 38 years goes into each of these jobs.

Double pivot tandem keeps load in balance in rough terrain, reduces wear and tear on axles and tires Hi-tensile pressed steel frame, wood surface block-type bolster plus other exclusive features gives you the kind of trailer you have needed .. and at a price that is less than you would expect to pay for such high quality.

Spencer-Safford LOADCRAFT
AUGUSTA, KANSAS

Please send me information on your
Pipeliner___ Pole Trailer___ Oil Field Float___
NAME_____
ADDRESS_____
TOWN_____ STATE_____

For more data on advertised products, use Readers' Service Cards, last page.

"Under Way On Nuclear Power"

As she blinked this terse message, the *USS Nautilus* cast off and steamed to sea leaving an old era of oceanic travel in its wake.

This is the first nuclear-powered, steam-turbine-driven submarine ever to be built. With the eyes of the world watching, it was a project with no margin for failure. Exhaustive sea trials which tested every feature of her equipment proved that the only acceptable result—success—had been completely realized.

We take pride in Walworth's share in this momentous achievement. For, from the days when the *Nautilus* was still on the drawing board to the last stage of construction, Walworth engineers worked directly with the Electric Boat Division of the General Dynamics Corporation—helping with the myriad of piping problems this new concept of transportation posed. Now the *Nautilus* prepares to join the fleet with Walworth Valves and Fittings, both standard and special items, installed.

We are glad to be aboard.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

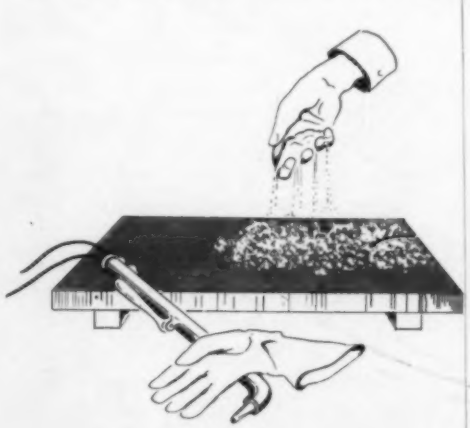
DISTRIBUTORS IN PRINCIPAL CENTERS
THROUGHOUT THE WORLD

ton, makes pedestals from the base of a belt-tightener by welding a piece of 8-inch pipe to the top. Babbitt, poured into the pipe, makes a bearing in which the piston rod will turn. Pedestals are supported by two pieces of ⅜-inch by 2-inch scrap brazed to their base. Pedestal bases are milled to fit the latheways for bolting to the lathe.

Bearing caps prevent the piston rod from raising. Two collars are installed on the piston rod on each side of the bearing next to the gear end of the rod to act as thrust rings, keeping the rod from moving back and forth.

A gear is bolted on the rod to turn the piston and rod. It is driven by a gear "chucked up" in the lathe.

The grooving tool is mounted on a raised bar on the lathe carriage as shown. This allows the tool bit to be on the center of the piston. The tool mount is made of two pieces of 3-inch angle iron welded together to make a square. The bar must be used because the carriage will not fit under the piston. The jig shown has been used to regroove 21½, 22, and 24-inch power pistons in a station shop.



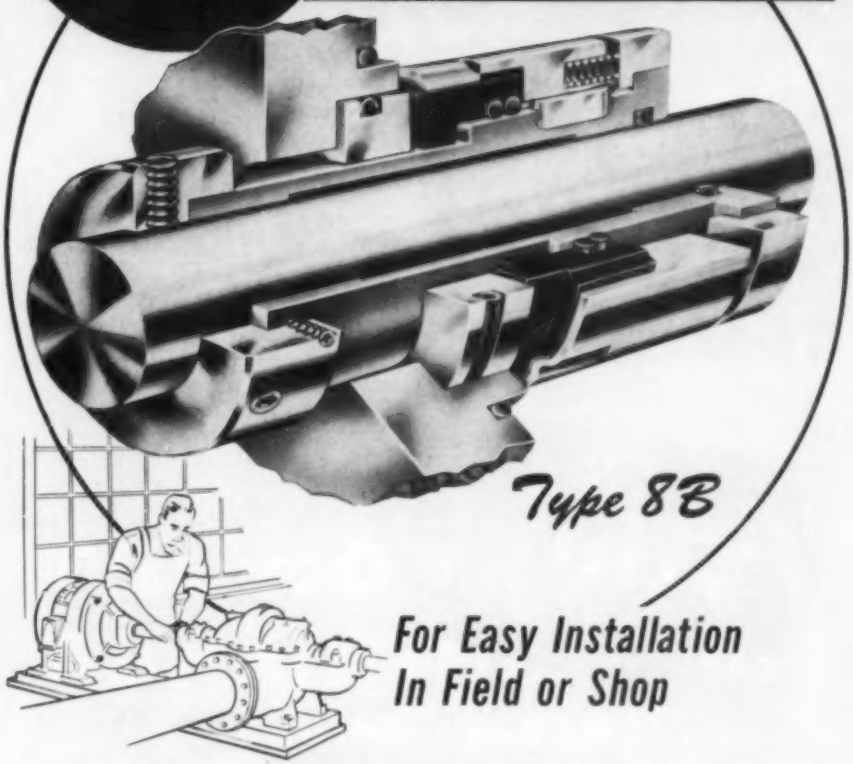
Fire Extinguishing Powder Makes Plate Cutting Safe

Oily steel plates may be cut or welded safely if fire extinguishing powder is sprinkled on the oil surface before lighting off the torch. Use of the powder prevents accumulation of explosive gases and ignition of the oil during cutting or burning.

The surface all around the working area should be completely covered with a light coating of the dry powder.

JOHN CRANE

PACKAGED TYPE MECHANICAL SEALS FOR High Pressure Pipe Line Pumps



For Easy Installation In Field or Shop

Manufacturers of large centrifugal pumps and pipe line operating engineers have long been asking for an end face mechanical seal meeting these requirements: 1) heavy-duty design to handle high pressure applications; 2) single-unit packaged construction for easy installation; 3) a full range of sizes to meet individual specifications.

"John Crane" has met this need with the Type 8B hydraulically balanced seals for pressures to 1200 psi.

These seals can be quickly installed and adjusted simply by sliding the entire unit along the shaft into final position. Removal of the top casing is not necessary. This feature alone results in the saving of many man-hours of maintenance work.

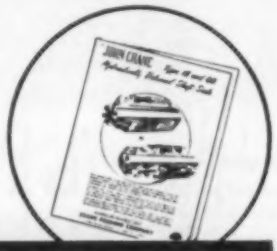
Field reports and performance records point to the steadily increasing use of "John Crane" high pressure seals to eliminate problems connected with the handling of hydrocarbons, crudes, gasoline and other petroleum products.

To help you in your individual requirements, "John Crane" offers nationwide service—available without obligation from strategically located factory owned branch offices.

Write for illustrated high pressure seal bulletin.

Crane Packing Co., 1834 Cuyler Avenue, Chicago 13, Illinois.

In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont.



JOHN CRANE CRANE PACKING COMPANY

For more data on advertised products, use Readers' Service Cards, last page.

Bullet-End Caps Speed Machine Threading

Starting pipe through a rotary pipe cleaning machine may be made faster and easier by fabricating a bullet-end cap. Make the cap by triangularly notching a cup joint of pipe of the same diameter as that to be cleaned. Bend the triangular "fingers" together to form a cone and weld the seams of the cone together.

The cap is held in place by four pieces of ¾-inch diameter rods welded inside the bullet-end cap. Rods are about 30 inches long and beveled so they can be rammed into the end of the pipe and securely fit the cap to the pipe.

To thread the pipe, the cleaning machine is aligned so that the bullet point coincides with the center of the machine frame. The cleaning machine is then shoved into place over the bullet-end cap and onto the pipe to be cleaned. One contractor has fabricated these caps for standard line pipe sizes from 6-inch to 18-inch.

LASTING ECONOMY

"DO-NUT" Wm SEAL CASING BUSHING

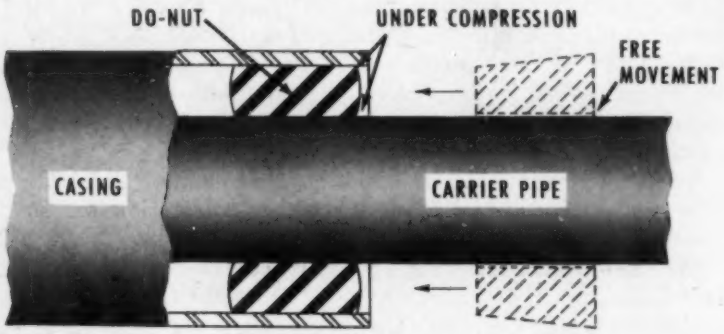
EASY INSTALLATION:
TAPERED O. D. OF DO-NUT
IS DRIVEN INTO CASING END

SIZES: 6" PIPE AND SMALLER

STANDARD FOR DISTRIBUTION AND GATHERING LINES . . .

The DO-NUT Bushing, a solid, massive ring of synthetic rubber, slides easily over carrier pipe; THEN as tapered o. d. is driven into casing end, the flexible synthetic rubber compresses against pipe and casing forming a WATER TIGHT SEAL.

- A MINUTE TO INSTALL
- NO WELDING REQUIRED
- NO METAL INVOLVED
- WATER TIGHT
- POSITIVE INSULATION



T. D. Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

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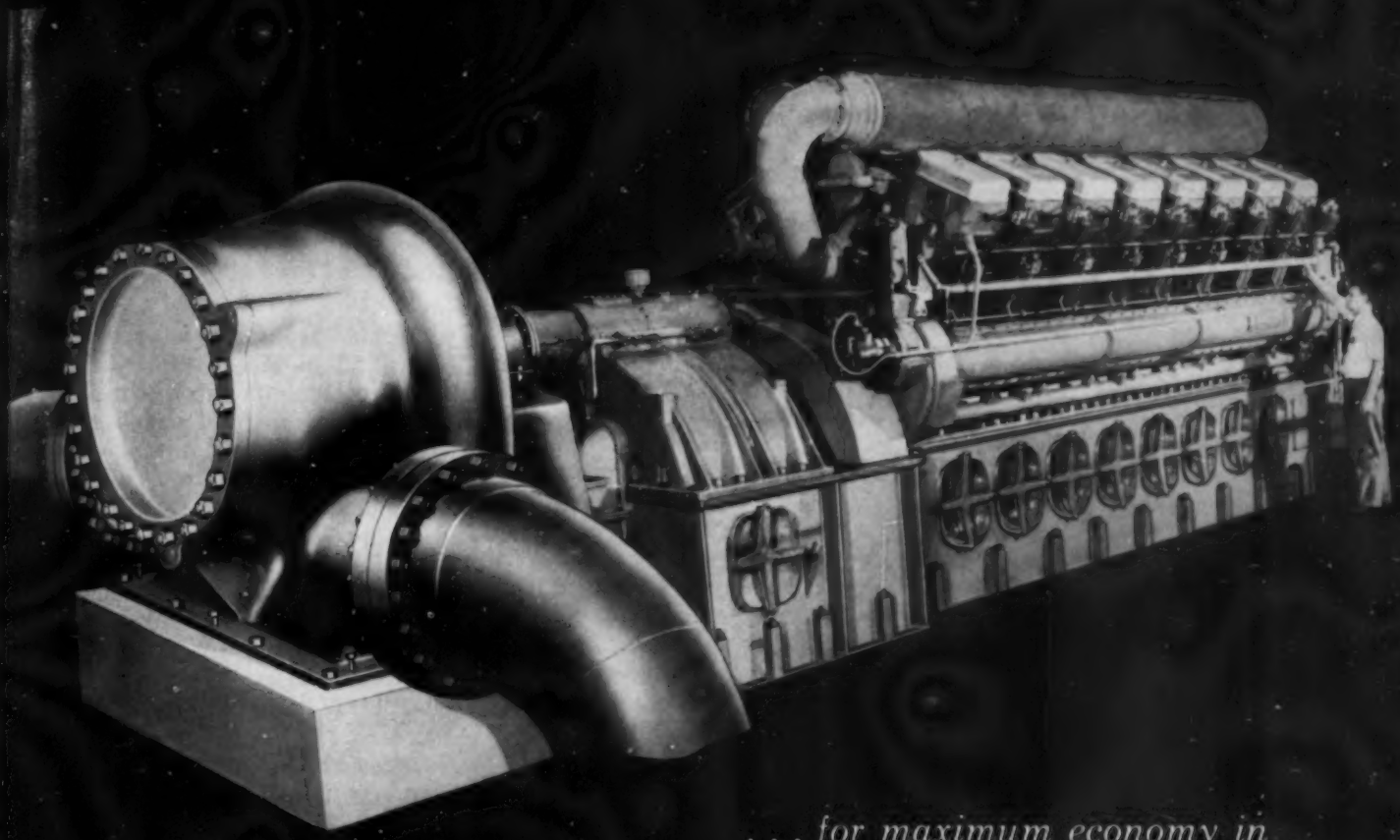
Tongue on Skid Rack Aids Drum Handling

A skid-rack which has a folding tongue permits drum products to be pulled about the job by a pick-up truck or winched onto the back of a truck. It also supports the drum at proper height for dispensing and enables workmen to rock it upright with ease.

The rack may be fabricated from scrap materials. Pieces of used sucker rod are bent to fit the drum and welded to runners as shown. Runner ends extend over the chime of the drum so that it may be tilted back and they may be slipped under the edge of the drum for placing on the rack. The drum can be set in the rack by tilting it back on the curved runners.

To speed handling with a winch line, a tongue is fitted to the rounded end of the rack. A piece of sucker rod is bent in a V-shape and two ¾-inch nipples are welded to each end as shown. A straight piece of rod is passed through the nipples and welded to the backside of the curved runners. The tongue permits straight, even pulling with a winch line when drums are drawn up onto trucks.



. . . for maximum economy in Gas Pipe Line service . . .

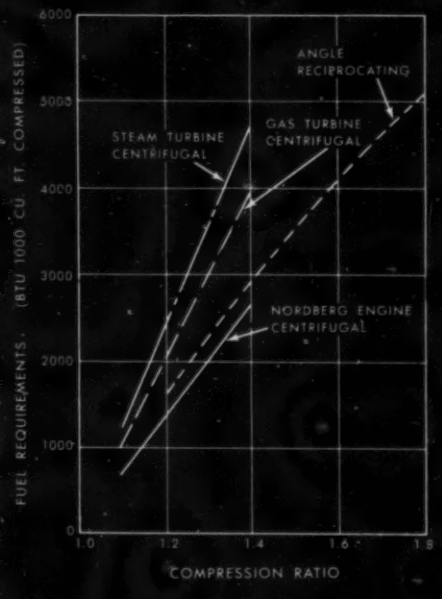
THE NORDBERG *SUPAIRTHERMAL*®

ENGINE-DRIVEN CENTRIFUGAL COMPRESSOR UNIT

Here is the latest development in compact, dependable power for maximum efficiency and economy in gas pipe line transmission service . . . *The Nordberg Supairthermal Engine-Driven Centrifugal Compressor Unit.*

Through use of exclusive design principles, the Nordberg *Supairthermal* spark-ignition gas engine operates at better than 40% thermal efficiency — with correspondingly lower fuel cost, increased horsepower, lower lube oil consumption, and lower maintenance costs per horsepower hour. The *Supairthermal* engine drives the compressor through a close-coupled speed increasing gear mounted on the bedplate extension of the engine.

Here, then, is an extremely compact, efficient engine-driven compressor unit which can be installed at low capital investment and operated at lower cost per horsepower than any other type of gas pipe line prime mover.



Savings of thousands of dollars per day in fuel costs on large gas pipe lines can be realized with the Nordberg engine-driven centrifugal gas compressor unit because this unit requires less fuel to compress gas than any other modern type of equipment of comparable capacity.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

© 1955, Nordberg Mfg. Co. 0155

Transco Begins $83 Million Project

Closely following the latest FPC order approving its plans for expansion, Transcontinental Gas Pipe Line Corporation announced that the company will proceed immediately with an $83 million unified construction program to increase New York area delivery capacity.

Major projects to be carried out in 1955 are the laying of 315 miles of 36-inch, 219 miles of 30-inch and 46 miles of smaller diameter pipe. Crossings of the Potomac and Savannah Rivers are included. Building of two new compressor stations, one in Texas and one in Louisiana, will add 10,500 horsepower to the system and round out the program.

Company engineers label the 36-inch pipe, first used on Transco lines in Mississippi and Alabama last year, a "super-inch" carrier. They report that service experience has shown that it can transport 69 percent more gas than a 30-inch line and almost three times as much as a 24-inch.

When the year's projects are completed, about 45 percent of Transco's line from gas producing areas to New York will have been looped. In all, the program will involve 23 separate construction projects in 11 states. Work will proceed simultaneously, with completion scheduled for the 1955-56 heating season.

Additional transmission facilities will enable Transco to increase daily capacity from 565 to 695 million cubic feet. Peak day allocated capacity will then reach 831 million cubic feet including delivery from storage. Forty-eight public utility, industrial and municipal customers will share in the increased allocations.

As the program got underway, Transco announced the awarding of contracts to seven pipe line contractors for the laying of 534 miles of line in eight states. Loop sections will parallel the company's present 30-inch main line. Work, to start in April, is scheduled for completion this fall. Contracts have been awarded to:

- O. R. Burden Construction Corporation, 5.31 miles of 36-inch and 25.4 miles of 30-inch in Louisiana.
- Associated Pipe Line Contractors, 63.5 miles of 36-inch in Louisiana and Mississippi.
- Midwestern Constructors, 14.5 miles of 30-inch and 53.5 miles of 36-inch in Alabama.
- Houston Contracting—H. C. Price, 84.8 miles of 36-inch in Alabama and Georgia.
- Western Pipe Line Constructors, 76.8 miles of 36-inch in Georgia and South Carolina.
- Panama-Williams Company, 36 miles of 30-inch and 31.4 miles of 36-inch in South Carolina and North Carolina.
- Williams Brothers Company, 72.2 miles of 30-inch in Virginia.
- Associated Pipe Line Contractors, 71 miles of 30-inch in Virginia and Maryland.

Good Old Days? When these pipeliners of the 1920's spoke of "horsepower" they were not speaking of engine ratings. They meant horses. When they drove the teams in in the evening they fed and cared for them. Gradually, when trucks and tractors began to replace the horses, the mule-skinners resented losing their jobs to the truck drivers and fought with them whenever they met. Clustered poles behind the men called "jacks" because of their resemblance to children's jacks, were placed along river banks to prevent washing.

Shell Pipe Line to Extend West Texas Crude Lines

Construction plans have been announced by Shell Pipe Line Corporation for 40 miles of crude gathering and trunk lines from West Texas fields. Twenty-two miles of six-inch trunk line and three miles of gathering lines will carry crude from the Ropes field in Hockley County to existing lines.

A second project calls for a 15-mile, four-inch trunk line from the Brahaney field in Yoakum County.

WEED PROBLEMS?

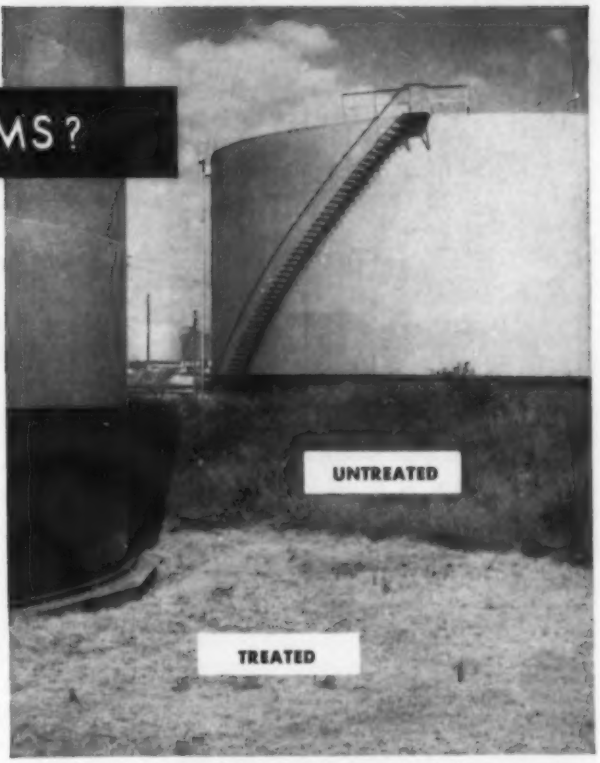
One application of

Du Pont Telvar®

WEED KILLERS

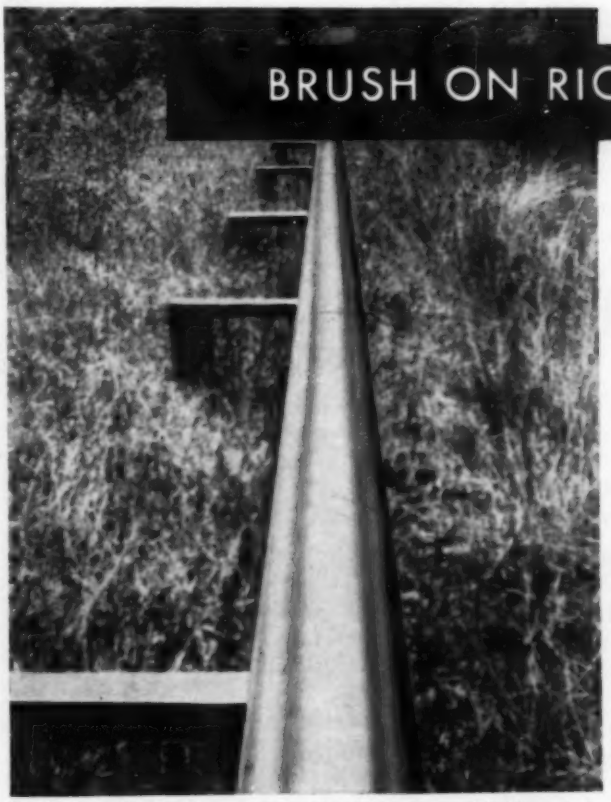
stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.



"Telvar" is ideal for weed control around tank farms, pipelines, pumps and derricks. It's non-toxic to humans and animals, non-flammable, non-volatile and non-corrosive to equipment.

BRUSH ON RIGHT-OF-WAY?



Brush along this pipeline was cleared and kept down with "Ammate." "Ammate" allows low-growing cover to return to resist erosion.

One application of

Du Pont Ammate®

WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

Telvar® Weed Killers for industrial use

DU PONT REG. U.S. PAT. OFF.

Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

PRESSURE & TEMPERATURE
SAFETY
PROTECTION

MERCOID®

MERCURY SWITCH EQUIPPED

CONTROLS

SERIES "D"
FOR PRESSURE & TEMPERATURE

Over a million of these mercury switch equipped controls are in use throughout every industry in the world SAFE-GUARDING costly equipment against HAZARDOUS pressure and temperature conditions.

Pressure types are available in 17 pressure ranges from 0-30" vacuum to 300-2500 psi with the sensitivity your application requires. Temperature types range from minus 30° to plus 60° F., up to 370-530° F. with varying sensitivities dependent upon range selected.

All types are bourdon tube operated and are equipped with external adjustments, visible dial and the famous Mercoid sealed mercury contact.

FOR ALL TYPES OF SERVICE

FOR GENERAL PURPOSE Nema 1

WEATHER-PROOF OUTDOOR SERVICE Nema 1A, 2, 3, 4

EXPLOSION-PROOF HAZARDOUS LOCATIONS Class 1, Group D Class 2, Group E, F, G.

Our engineers are at your service—send in your control problem or WRITE FOR CATALOG 700B

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

Two Companies to Build Texas-Florida Gas Line

Plans have been announced for a 1450-mile line to carry natural gas from the Rio Grande Valley and the Texas and Louisiana Gulf Coast to southern Florida. The new line, to be made up of 30, 24, and 18-inch sections, will cost an estimated $185 million.

Coastal Transmission Corporation will build a 500-mile section from McAllen, Texas, to the Mississippi River where it will connect with the line to Florida. This first section will cost $75 million. Houston-Texas Gas and Oil Corporation will build the 950-mile line from Coastal's Louisiana connection to Miami.

Four compressor stations are planned to give the line a scheduled capacity of 350 million cubic feet of gas per day. Sixty-nine laterals will serve 39 communities in Florida.

Company officials say construction is scheduled to start as soon as FPC approval is obtained.

Colorado Interstate Gas Revises Branch Route

Colorado Interstate Gas Company announced it will change the route of its proposed Rock Springs-Denver branch from the Pacific Northwest gas pipe line. The new route will add delivery points to Colorado-Wyoming Gas Company at Cheyenne and Greeley.

Plans now call for the line to run east to Cheyenne and then south to Denver, passing near Greeley and Brighton.

Houston Welding School Is Government Approved

The Houston Welding School and Testing Laboratory has graduated more than 275 welders during the past two years. The school is now approved for instruction under the G. I. "bill of rights."

Classes as large as 95 men can be taught at one time. The course includes electric arc, heliarc and automatic welding in various phases for pipe line construction and industrial trades.

Supervision of the course is under the direction of former pipe line welding superintendents with 30 years experience in the field.

Planning a Pipeline?

When ready for bids . . . contact us.

Our 32 years of construction experience assure satisfaction.

SIGN OF SATISFACTION
TRANSMISSION LINES
DISTRIBUTION SYSTEMS

SOMERVILLE CONSTRUCTION COMPANY
ADA, MICHIGAN

GAUGE REPAIR

FAST SERVICE

GUARANTEED WORK

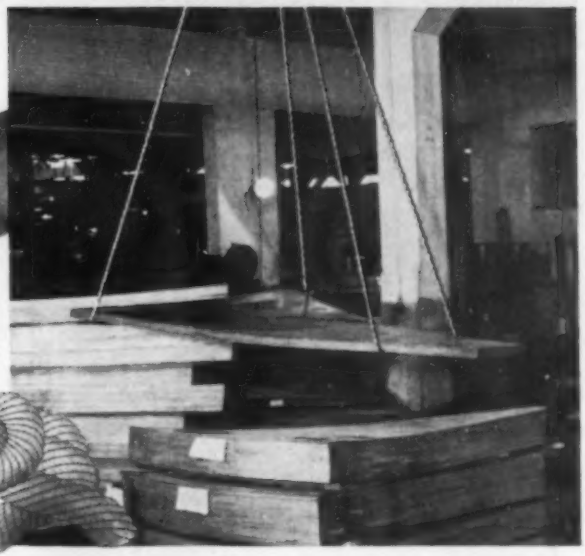
We put the accuracy back in your gauge or instruments. We have large stocks of new gauges. Quality work.

TULSA GAUGE AND INSTRUMENT CO.
1133 N. UTICA • TULSA, OKLA.

PROVE Tuffy®

GIVES YOU MORE SERVICE PER DOLLAR

FREE Tuffy® SLING



ABUSE IT! MISUSE IT! IT WILL STILL PROVE TOUGHEST SLING OF ALL!

Do Your Worst to the free Tuffy Sling we send you! Loop it, kink it, jerk it, knot it—subject it to the conditions that ruin the most slings for you. You'll find Tuffy takes more rough treatment than any sling you've ever used!

Tuffy's Patented Construction is an exclusive, machine braided-wire fabric that's extra flexible to help resist kinking. If you *can* kink it, your Tuffy Sling is easy to straighten without material damage!

Send For Your Free Tuffy Sling and try it on the toughest tests you can devise. Find out for yourself why Tuffy Slings are the toughest you can buy!

Tuffy® HOIST LINE

Strong As Tuffy Slings! Tuffy Hoist Line is constructed to handle the varied strains of lifting over a long period of time . . . give you extra safety from drum to sling!

Easy To Order because there are no complicated specifications — just length, diameter and "Tuffy Hoist Line." Whether you use overhead, stiff leg or mobile cranes, derricks or clam shells, try Tuffy Hoist Line and see the difference!

Your Tuffy Distributor Stocks to Meet Your Needs

When You Need Rope Fast, your Tuffy distributor is a handy man to know. Because he's happy to stock ahead of your replacement schedule . . . be ready with the rope you want, *when* you want it. Just give him an idea of your requirements and he will order from his nearby mill depot for months-ahead service. Talk to him *soon!*

TEAR OFF AND MAIL COUPON *NOW!*

Union Wire Rope Corporation
2278 Manchester Ave., Kansas City 26, Mo.

At no cost or obligation to me, please rush the material I have checked

- ☐ FREE 3-Ft. Tuffy Sling!
- ☐ FREE Sling Handbook and Rigger's Manual, Featuring 12 Tuffy Factory-Fitted Types!
- ☐ Name and Address of Tuffy Distributor Nearest Me!

FIRM NAME _____

BY _____ TITLE _____

ADDRESS _____

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union Wire Rope **corp.**

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Ohio Oil Storage Facilities Completed at Columbus

Construction crews recently completed work on eight storage tanks having a total capacity of 8,652,000 gallons at Ohio Oil Company's new Columbus terminal. Distribution facilities are scheduled for operation in May. An extension of the products line from Ohio's Robinson, Ill., refinery will serve the terminal.

Latest developments have been used in products marketing. A large semi-automatic loading rack will load transport trucks quickly and safely. Also located on the 30-acre tract are a concrete block office building for marketing and operating personnel and a metal warehouse for distribution of products.

Wilcox Trend Seeks Approval for New Facilities

Additional compression facilities, 16 miles of 16-inch line, some smaller lines and a field compressor station are sought by the Wilcox Trend Gathering System, Inc. in a recent FPC application. The project will cost an estimated $2,900,000.

The proposal includes a new 2000 horsepower compressor station to be built near Charco, Texas and additional compression facilities of 2200 hp at the company's Thomaston, Texas, station. A 16-mile loop of 16-inch will be built along the main line southwest of Provident City, Texas. Some additional small diameter lines will be laid and a 75 hp field compressor station installed.

Wilcox claims that the added facilities are necessary to fulfill an anticipated daily delivery obligation of more than 180,000 Mcf to Texas Eastern late this year. Proposed additions will increase the capacity of the Wilcox system to about 200,000 Mcf per day.

FPC to Hear Suppliers Of American Louisiana

The Federal Power Commission has scheduled a hearing on April 18 for four producers which propose sale of natural gas to American Louisiana Pipe Line Company. A Commission certificate was issued last October authorizing construction of a natural gas pipe line from North Tepetate, La. to Detroit on the condition that the company could not commence construction until the producers have applied for and obtained FPC authorization.

These hearings involve Superior Oil Company, Kerr-McGee Oil Industries, Stanolind Oil & Gas Company and British American Oil Producing Company. The four companies propose to produce and sell natural gas to American Louisiana under contracts providing various adjustments and favored-nations clauses.

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THE VERTICAL PUMP BY JOHNSTON, Johnston Pump Company, 3272 E. Foothill Boulevard, Pasadena, Calif. $10.

A complete and authoritative reference book for the vertical turbine pump industry, this new manual discusses pump selection for hot, volatile, viscous and corrosive fluids, applications, engineering formulas and data.

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Indexed, the new book furnishes the foundation upon which the engineer may base his premise and evaluate his individual pumping problem. Basic design principles and operating characteristics are outlined and examples given to show their practical applications.

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Operator Del Marous, Trebec Excavating Co., Euclid, Ohio

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Magnolia Plans to Loop One Line, Convert Another

Two construction projects have been announced for 1955 completion by Magnolia Pipe Line Company of Dallas. The first calls for extensive loops on the company's 335-mile Midland-Corsicana, Texas line to increase capacity by 162,000 barrels per day. Loops consisting of 215 miles of 12-, 14- and 16-inch line will be laid at various points.

Plans call for enlarging pumping facilities at six of Magnolia's main line pump stations between Midland and Corsicana. The added Midland-Corsicana capacity will also require the addition of a new pumping station near Groveton, Texas, on the company's Corsicana-Beaumont line.

Work on the West Texas loop is scheduled to begin about April 1. Construction will be completed about October 1.

Following the announcement of the additional crude handling capacity, Magnolia officials disclosed that one of the company's West Texas-Beaumont crude oil lines will be converted to LPG products service.

The line to be converted originates at Midland and will serve gasoline plants in the Pegasus-Midkiff area as well as lines from other sources in West Texas. It is an eight-inch line to Corsicana and ten-inch from there to Beaumont. When converted, products may be delivered to Magnolia's underground storage reservoir at Hull, Texas, or to the Beaumont refinery where the stream can be separated into various products. Butanes and propane may then be moved from the refinery to the Hull storage reservoir in lines already available.

Conversion of the line will be underway soon and is scheduled for completion by January, 1956.

Lone Star Gas Announces $22 Million Program

Lone Star Gas Company of Dallas has announced plans to spend $22 million for construction this year, with over $18 million slated for new facilities. Largest single item in the budget is $4,438,700 for the transmission division to cover construction of additional gathering and transmission pipe lines, city gate stations and tap lines. Also included are dehydration plants, construction and enlargement of compressor plants and strengthening of underground storage facilities.

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Shell Oil and Murphy Corp. Form Butte Pipe Line Co.

Shell Oil Company and the Murphy Corporation have announced plans to construct a new pipe line from eastern Montana to connect with existing trunk lines in Wyoming. The 16-inch, 450-mile line will carry crude to Platte Pipe Line at Guernsey and Western Pipe Line at Fort Laramie. A 10-inch line will run from the East Poplar field to a point near the present Colgate loading rack where it will tie into Shell's new 12-inch line. From Cabin Creek, Mont., a 16-inch line will pass Baker, Mont., and Moorcroft, Wyo., and connect with the lines in southeastern Wyoming.

When completed the new line will provide an outlet for eastern Montana Williston Basin pools and other production in northwestern South Dakota and eastern Wyoming. Shell Pipe Line personnel will build and operate the new line as the Butte Pipe Line Company.

Construction on the $18 million line is slated to begin as soon as spring weather conditions are favorable.

Pipe Line Contracts Not Let

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alabama-Tennessee Natural Gas Co.—Florence, Ala.	25	8, 12	Gas	Alabama	$808,450	3.7 miles authorized
Alberta Gas Trunkline Co., Ltd.	315	18-36	Gas	Alberta Fields—Trans-Canada Terminal on Alberta-Sask. boundary	$37 million	Planned
American Louisiana Pipe Line Co.—666 Penobscot Bldg., Detroit, Mich.	1,289	22, 30	Gas	North Tepetate, La.—Detroit, Mich.	$130 million	1,172 miles conditionally authorized
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425 plus 485 miles feeders & distribution lines	24, 26	Products	Beaumont, Texas area—Newark, N.J.	$170 million	Planned
Anadarko Basin Pipe Line Co.	525	24	Gas	Wise County, Texas—Texas Eastern near Memphis, Tenn.	.....	Planned
Arkansas-Louisiana Gas Co.	66	24	Gas	Arkansas, Louisiana and Texas	$9,245,166	Approved
Ar-Mex Pipe Line Co.	900	8, 12, 14	Crude	Guernsey, Wyo.—Phoenix, Ariz.	$31 million	Planned
Attock Oil Co.	60	....	Gas	Dhulian Field—Rawalpindi, West Pakistan	.....	Planned
Butte Pipe Line Company-(Shell-Murphy)	450	16	Crude	Williston Basin—Guernsey and Fort Laramie, Wyo.	.....	Proposed
California-Oregon Pipe Line System	103	6	Crude	Crescent City, Calif.—Medford, Ore.	$2 million	Planned
Carolina Natural Gas Corp.—701 Wilder Bldg., Charlotte, N.C.	185	2, 12	Gas	North and South Carolina	.....	Proposed
Central Hudson Gas & Electric Co.	48	12	Gas	Albany—Kingston, N.Y.	.....	Applied to FPC
Cities Service Gas Co.—1st National Bank Bldg., Oklahoma City, Okla.	33	20, 26	Gas	To replace lines in Kansas and Missouri	$1,860,000	Authorized
	13	....	Gas	Labette County, Kansas	$285,000	Authorized
	15.5	16	Gas	Carter County—Garvin County, Okla.	$541,050	Authorized
	11.5	2, 4, 8	Gas	Johnson and Cass Counties, Mo.	$140,000	Before FPC
City of Dalton, Ga.	39	8	Gas	To connect with Southern Natural Gas Co. line	$2,940,000	Proposed
Clinchfield Coal Corp.—Dante, Va.	16	12	Gas	Dickenson County, Va.—Osborne Gap, Ky.	$785,000	Before FPC

Continued on Page 80

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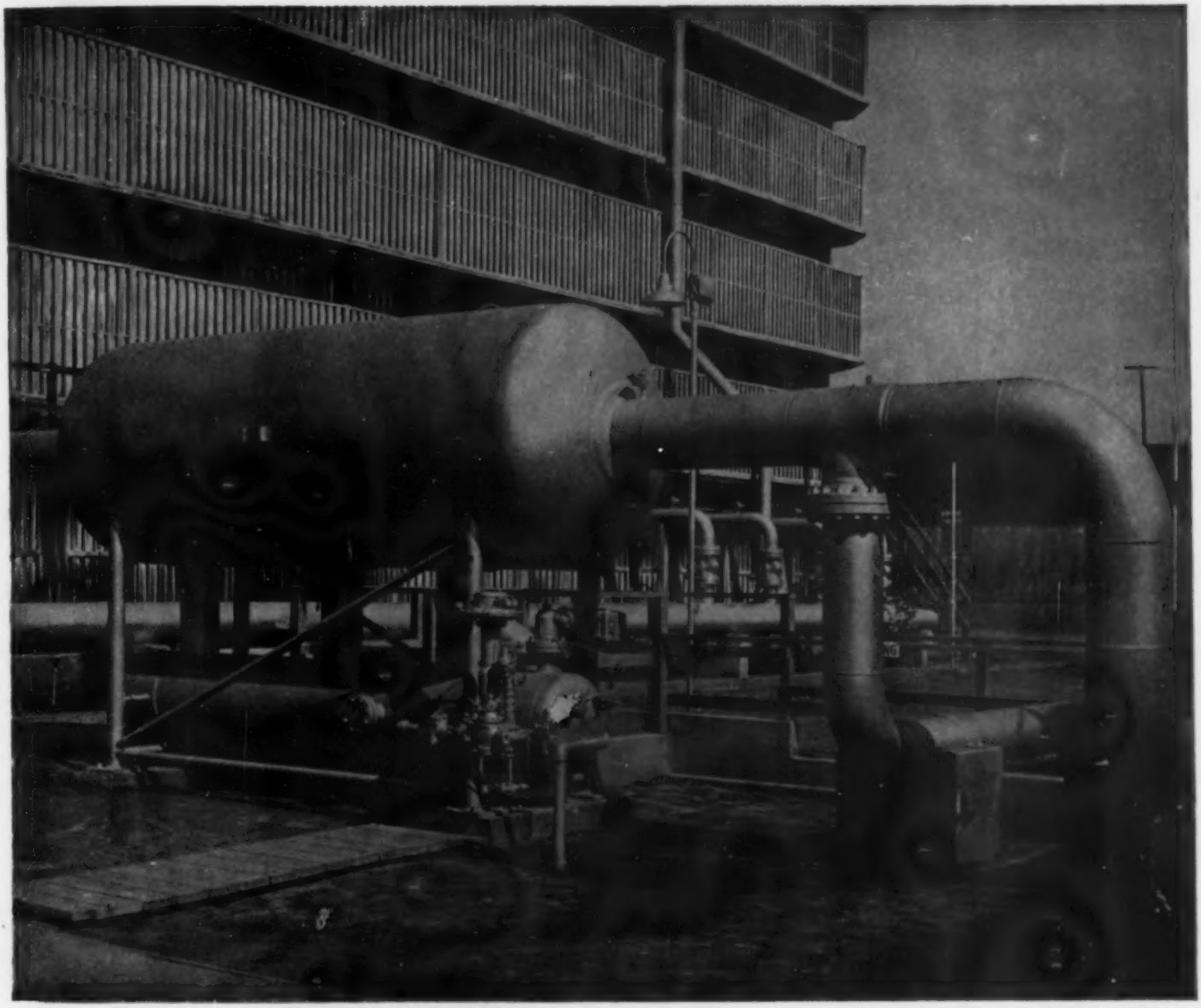

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Pipe Line Contracts Not Let—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Coastal Transmission Corp.—Houston, Texas	500	30	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas.	$110 million	Proposed
Coast Counties Gas & Electric Co.—369 Pine St., San Francisco	40	3, 4, 8	Gas	Coast and Valley region, Calif.	.....	Planned
Colorado Interstate Gas Co.	365	22	Gas	Rock Springs, Wyo.—Denver, Colo.	$23,299,000	Authorized
	115	4, 6, 8	Gas	Denver—Julesburg Basin—Basin Cities	.....	Before FPC
Colorado Western Pipe Line Co.—Dallas	708	....	Gas	Southeastern Colorado fields—Denver, plus laterals	$30 million	Planned
	328	16, 18	Gas	LaPlata County—Pueblo, Colorado Springs and Denver	$21,600,000	Authorized
Compania del Oleoducto Buenaventura—Cali, Colombia, S.A.	90	....	Products	Buenaventura—Cali, Colombia, S.A.	$4 million	Planned
Consolidated Gathering Systems, Ltd.	198	....	Crude	Sturgeon Field—Edmonton.	.....	Planned
Dixie Pipe Line Co.	20	8	Gas	Gwinville Field, Miss.—Transcontinental Gas line	$425,000	Proposed
El Paso Natural Gas Co.—El Paso, Tex.	32.5	10	Gas	Reagan and Upton counties, Texas	$799,000	Authorized
	74	....	Gas	Texas, New Mexico and Arizona	$13,800,000	Authorized
	370	....	Gas	Mountain Home, Idaho—Reno, Nev.	$35 million	Proposed
Empresa Nacional del Petroleo	80	6	Products	Concon—Santiago, Chile	.....	Planned
Governments of Southern Rhodesia and Portuguese South Africa	200	....	Products	Beria, Portuguese Mozambique—Umtalia, Southern Rhodesia	.....	Considered
Hope Natural Gas Co.—445 W. Main St., Clarksburg, W. Va.	33	8, 10, 12	Gas	Wyoming County, W. Va.—Buchanan County, Va.	.....	Proposed
Houston Texas Gas & Oil Co.—4604 Main St., Houston	1042	18, 24, 36	Gas	Louisiana—Miami, Fla.	$110 million	Proposed
Idaho Natural Gas Co.—Goodland, Kansas	....	....	Gas	Pacific Northwest line—points in Southern Idaho	.....	Proposed
International Pipe Line Co., Inc.—227 N. Colfax Ave., Minneapolis, Minn.	132	8	Products	Wrenshall, Minn.—Minneapolis Bulk Terminal	$4,250,000	Planned
Kansas-Nebraska Natural Gas Co.—Phillipsburg, Kansas	283	6-12	Gas	Central and northeast Nebraska	$4,096,890	Some contracts let
Kentucky-West Virginia Gas Co.	32	12	Gas	Service line to Maytown, Ky.	.....	Before FPC
Keystone Pipe Line Corp., Philadelphia	48	8	Products	Boot—Fullerton, Pa.	$1,875,000	Approved
Lateral Gas Pipe Line Co.—Cedar Rapids, Iowa	27	4	Gas	Grant—Clarinda, Iowa	$267,000	Proposed
Lone Star Gas Co.	205	24	Gas	Snyder—Fritch, Texas	.....	Considered
Malco Pipe Line, Inc.	91	6	Products	Prewitt, N.M.—Albuquerque	$1,250,000	Planned
Mayflower Pipe Line Co.-(Pine Tree Natural Gas Co.) —70 Pine St., New York, N.Y.	200	....	Products	New Jersey refining area—New England	.....	Planned
Michigan Consolidated Gas Co.—415 Clifford, Detroit	25.5	12	Gas	Sparta—Muskegon, Mich.	$13 million	Proposed
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	252	4-24	Gas	Wisconsin	$11 million	Proposed
Missouri Central Gas Co.	25	6	Gas	Moberly—Macon, Mo.	.....	Proposed
Missouri Public Service Co.—Warrensburg, Mo.	136.4	8-10	Gas	New Franklin, Mo.—Grundy County, plus laterals	$5 million	Proposed
Montana-Dakota Utilities Co.—Minneapolis	56	2, 4, 6	Gas	Hettinger and Stark counties, N.D.	$728,854	Authorized
Moore-Stoner Co.	200	6	Products	Glendive, Mont.—Minot, N.D.	$2,000,000	Planned
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	479	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Before FPC
Natural Gas Producers, Inc.—Colorado Springs	61.8	12	Gas	Yenter Pool—Denver	$1,374,000	Planned
	49	10	Gas	Denver-Julesburg Basin—Fort Morgan, Brush and Denver	.....	Planned
Natural Gas Storage Co. of Illinois—Chicago	35	36	Gas	Delivery from Herscher, Ill. storage field	$7 million	Before FPC
Nebraska Pipe Line Co.	220	6	Products	Cheyenne, Wyo.—North Platte, Neb.	$4 million	ODM certificate granted
New River Gas Co.	50	....	Gas	Summers-Monroe Counties, W. Va. and Narrows and Dublin, W. Va.	.....	Planned
NNCW Pipe Line Co.—Dallas, Texas	127	8, 10	Crude	Clareton Field—Casper, Wyo.	$3.6 million	Planned
North Dakota Natural Gas Co.—St. Paul, Minn.	500	6, 10, 12	Gas	Tioga-Minot, Fessenden, Devils Lake and Fargo, N.D., plus 6" feeder lines.	$10.8 million	Proposed
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	329	2, 12	Gas	Sioux Falls to Aberdeen, S.D.	$6,661,100	Proposed
	310	24	Gas	Tioga to Fargo, N.D.	$18,494,000	Planned
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	403	24, 30	Gas	Emerson, Manitoba, Canada—Farmington, Minn.	$32,813,000	Before FPC
Northwestern Utilities, Ltd.—10124-104th St., Edmonton, Alberta, Canada	42	12	Gas	Bonnie Glen—Edmonton, Alberta	$1.4 million	Proposed
Pacific Northwest Pipe Line Corp.—M&M Bldg., Houston	1466 plus 443	Various	Gas	San Juan Basin—Pacific Northwestern states	$163 million	Approved
Pawnee Pipe Line Co.	15	8	Crude	Northeast Colorado Sector—Denver-Julesburg, Basin	.....	Planned
Peace River Oil Pipe Line Co., Ltd.	106	12	Crude	Sturgeon Field—Edson, Alberta, Can.	.....	Planned
Permian Basin Pipe Line Co.	11	6	Gas	Lea County, N.M.	.....	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	260	6, 8	Products	Lagos, Mexico—Guadalajara, Aguascalientes and Salamanca	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	72	12	Crude	Poza Rica—Atzacapotzalco, Mexico	.....	Proposed
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
Salt Lake Pipe Line Co.	....	....	Products	El Paso, Texas—Albuquerque, N.M.	$4 million	Planned
Santos Jundiai Railway Co.—Brazil	....	8, 14, 22	Crude & Products	Expansion of Santos—Sao Paulo system	$5 million	Planned
Shell Pipe Line Corp.	22	6	Crude	Ropes Field, Texas	.....	Proposed
	15	4	Crude	Brahaney Field, Texas	.....	Proposed
Shenandoah Gas Co.—Lynchburg, Va.	40	3, 4, 8	Gas	Virginia Gas Transmission Co. System—Virginia and West Virginia towns	$1,470,000	Authorized
Sioux Oil Co.	50	....	Products	Newcastle, Wyo.—Rapid City, N.D.	$1 million	Planned
Southern Pacific Pipe Lines, Inc., San Francisco	....	8-16	Products	Los Angeles—El Paso	$30 million	Planned
Sturgeon Pipe Line, Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	Products	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tennessee Gas Transmission Co.—Box 2511, Houston	248	24	Gas	Hebron Storage Field, Pa.—Greenwich, Conn.	$28,700,000	Authorized
	370	30	Gas	Agua Dulce, Texas—Kinder, La.	$35.4 million	Before FPC
	36	26	Gas	Ohio Loop	.....	Planned
	19	24	Gas	Hebron, Pa., Storage—Harrison, Pa., Storage	.....	Planned
Texas Eastern Transmission Corp.—Texas Eastern Bldg., Shreveport, La.	382	24	Gas	Beaumont, Texas—Kosciusko, Miss. plus 99 miles lesser diameter	$71.8 million	Proposed
Texas Gas Transmission Co.—416 W. 3rd St., Owensboro, Ky.	81	20, 26	Gas	Looping portion of Louisiana-Tennessee Line plus 100 miles smaller lines in Southern Indiana	$17.5 million	Proposed
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Approved
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
Triangle Pipe Line Co.	560	12	Products	Arkansas City, Ark.—Covington, Ky.	$24.5 million	Proposed
Union Oil Co. of Canada, Ltd.—Chatham, Ontario	180	24	Gas	Dawn Gas Field to Lamberton County to deliver gas to Dominion Gas Co.	.....	Planned
U. S. Navy	600	10	Products	Rota—Zaragosa, Spain	$40 million	Planned
	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Utah Natural Gas Co.	40	16	Gas	Orem—Salt Lake City, Utah	.....	Planned
Virginia Natural Gas Co.	153	....	Gas	Buckingham—Richmond and Portsmouth, Va.	.....	Planned
West Coast Pipe Line Co.—Mercantile Bank Bldg., Dallas	960	24, 26	Crude	Wink, Texas—Norwalk, Calif.	$106 million	Planned
Westcoast Transmission Company, Ltd.	650	30	Gas	Peace River Fields-Sumas, Wash.	$140 million	Proposed
	....	30	Gas	Peace River Fields—Okanagan Valley	.....	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Loop near Provident, Texas	$2.2 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	Products	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Wyoming Gas Products Corp.	....	....	Gas	Gathering system in Weston County, Wyo. to feed gasoline plant	.....	Planned
Yacimientos Petroliferos Fiscales Bolivianos	170	4	Crude	Bermejo—Tupinsa, Bolivia	.....	Planned

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PIPE LINE INDUSTRY'S VIEWS OF THE NEWS

HEADLINES OF THE MONTH

• FPC members take industry's side in gas fight . . . • Union asks another pay hike . . . • Application to import Canadian gas approved . . . • Imports row centers on Neely bill.

FPC Officials Push Gas Bill

Federal Power Commission regulation of independent gas producers is unjust, unfair, unreasonable—and just about impossible.

That was the opinion delivered by two FPC members late last month as industry's fight to overthrow the Phillips mandate through congressional legislation entered a new and decisive phase.

The jockeying, maneuvering and sparring were over. From now on it was for keeps.

Hearings were begun in Rep. Percy Priest's House Commerce Committee with 100 to 200 witnesses expected to have their say, with time out for an April 1-14 Easter recess.

First witness was FPC Chairman Jerome Kuykendall, who echoed a 15-year stand of the Commission by saying Congress should exempt independent producers from federal regulation in order to serve the greatest good of the largest number of people in this country. He made these points:

• Gas production is a competitive industry lacking the characteristics of a public utility.

• There is no reason why natural gas should be regulated while coal and oil are not.

• Any move to fix the price of gas lower than the equivalent price of other fuels would drive the competing products from the market and hasten the exhaustion of gas reserves.

• Federal regulation would cause gas producers to sell intrastate, thus forcing the concentration of U. S. industry in gas-producing states.

• Federal regulation would result in diminishing gas supplies for consumers, and on the other hand, exemption of producers from federal regulation will encourage interstate sales and ultimately result in lower rates.

Kuykendall was specifically pumping for the Harris-Hinshaw bill, which he said would write into law the fair field price for production owned by pipe line companies as held in the Panhandle Eastern case. He assured that there is nothing in the bill which would allow pipe line companies more than the actual cost of gas bought from independent producers.

A day earlier, Kuykendall told the House Appropriations subcommittee that, because of failure to receive a supplemental appropriation requested last year, FPC is hopelessly incapable of coping with the staggering workload thrust upon it as a consequence of the Phillips decision.

At the same hearing Commissioner Nelson Lee Smith declared that FPC probably won't be able to decide for another year how to regulate independent gas producers in the event Congress fails to overturn the Phillips mandate. "I personally feel," he said, "it is going to be a year before the commission will know exactly what the standards are and how it is going to regulate producers. We are going to be faced with court decisions, without doubt."

Meanwhile, President Eisenhower refused to throw his weight behind the Cabinet Fuels Policy Committee's view that independent producers should be freed of federal controls. The President said his Cabinet Committee had submitted its conclusions to him, but that there was no action on his part in giving the report his final approval.

Capitol observers interpreted the President's stand as meaning that the Democrats must shoulder all criticism for amending the Gas Act.

Other developments:

• Coal was fighting hard for the Staggers bill, which provides that "no rate or charge shall be considered just or reasonable which is less than the cost of such gas plus the cost of transportation and sale, and a fair proportion of the fixed charges."

• A 16-man delegation of city officials led by Senator Wiley of Wisconsin told the President that freeing federal controls from natural gas would add between $200 and $400 million annually to consumers' gas bills.

What Harris Bill Provides

The Harris bill, which differs from about a dozen others only in phraseology, would limit FPC authority to gas sales after delivery to interstate lines. All production, gathering, processing, treating and compressing in the producing field or vicinity would be exempt. The bill also declares that when an interstate gas company seeks a rate hike on the basis of a new contract to buy gas from a non-affiliate, FPC shall allow as an operating expense the reasonable market price in the field, plus a fair gathering charge. The same price should also be permitted in cases of proposed rate hikes covering gas which an interstate gas company produces itself through a subsidiary or buys from an affiliate.

The bill further declares that FPC must not allow as an operating expense any price paid for gas greater than the reasonable market price in the field, plus a fair gathering charge in cases where this is not included in the market price.

Harris assured the House that the bill provides protection for the consumer by establishing a fair basis for determining gas company rates.

Union Asks Another Hike

O. A. (Jack) Knight accepted new union power with one hand last month and with the other beckoned for a second round of pay raises during 1955.

Actually, the initial round of 4 percent increases (10 cents per hour average) had barely begun before

Knight asked for a second helping. It was one of his first official acts after becoming president of the Oil, Chemical and Atomic Workers International Union-CIO, formed by the Cleveland merger of his 93,000-man Oil Workers International Union and the 75,000-man United Gas, Coke and Chemical Workers of America.

It would have been to Knight's greater glory had the oil companies held back their pay offers until after he had demanded them as president of the new union.

But the grants were made and accepted prematurely, from his point of view, so he quickly switched tactics. "It is the attitude of the union," he declared, "that what we are actually getting is a wage increase in 1955 which was due to oil workers in 1954. Therefore, there is a strong possibility that within a few months we may launch a new campaign for 1955 wage increases. Lending weight to this threat was that the CIO units which were among the first to accept the company offers did so with the stipulation that they could reopen wage talks again this year.

The independent unions were the first to accept pay hikes. Standard Oil Company (New Jersey) led off with an offer, followed by Humble Oil & Refining Company, Standard Oil Company (Indiana) and Continental Oil Company. Others joined the parade.

First CIO units to agree on pay terms were at Magnolia Petroleum Company, and next was at Gulf Refining Company. The Magnolia local at Wichita Falls was first in line among the production workers.

Rate Filings Cleaned Up

The Federal Power Commission has about cleaned up the job of processing approximately 10,000 rate filings made by independent natural gas producers since the Supreme Court's decision in the Phillips Petroleum Company case.

As of Feb. 23 FPC had received about 5700 applications for certificates authorizing independent producers to sell gas to interstate companies. Of these, 550 certificate applications had been acted upon. The remainder are being processed, have been set for hearing, or are pending.

In brief . . .

Hauls of liquid petroleum by for-hire carriers amounted to 58,488,790 tons in 1954, up 4.3 percent over 1953, according to the American Trucking Institute.

A $16 million pipe line development program to facilitate domestic distribution and exports of surplus oil is planned by Bolivia.

Panhandle Eastern Pipe Line Company gave notice it will go to Supreme Court, if necessary, to establish its right to intervene in proposed construction of a gas line from Louisiana to the Detroit vicinity. The applicant for the $130 million line is American Louisiana Pipe Line Company.

Social security can now be arranged for U. S. citizens employed abroad. A firm can obtain such benefits for its employes if it controls the foreign subsidiary or hold a majority interest in another foreign firm controlling the subsidiary. A standard form of agreement, Form 2032, is now available at Internal Revenue Offices.

FPC reported that U. S. electric power plants consumed record amounts of fuel oil and coal during January, but use of natural gas dropped below year ago. Fuel oil consumption was up 3.7 percent from previous high in December, 1952, and up 7.6 percent over January, 1954. Coal use was up 1 percent from previous record set in December, 1954, and 10.1 percent above year ago. Gas consumption was down 3.4 percent from year ago and 13.1 percent below December.

Standard Oil Company (New Jersey) estimated its consolidated net earnings for 1954 at $584 million, equal to $9.55 a share on the average number of shares outstanding during the year. The Jersey group spent about $754 million last year on capital projects and exploration.

The House Appropriations Committee approved the $250,000 request for the Oil and Gas Division, together with $140,000 for enforcement of the Connally hot oil law.

Imports of Gas Approved

Canadian origin is no bar to FPC approval of gas distribution in the United States.

This was the precedent-setting ruling laid down last month by FPC Examiner Richard N. Ivins, who approved the first large-scale proposal to import Canadian gas for general distribution in the U. S. He authorized Montana Power Company to import from Canada up to 100 million cubic feet of gas per day, with an annual maximum of 20 billion cubic feet. The authorization extends until May 14, 1974.

Montana Power had previously been authorized to import gas, but only for Anaconda Copper Mining Company.

The new supplies would be piped from the Pakowki Lake area in Southeastern Alberta after production and gathering by Canadian-Montana Gas Company, Ltd., subsidiary of Montana Power. Canadian-Montana Pipe Line Company, another subsidiary, would make delivery to Montana Power through existing facilities at a point near Whitlash, Mont., on the U. S.-Canadian border.

The Canadian gas would supply present markets in Montana, plus new service to 11 towns. The company would spend about $9½ million for expansion.

To coal and labor representatives' objection that the application should be denied because of the lack of an intergovernmental agreement between the U. S. and Canada to assure a continuous supply, Ivins referred to the amicable relations between the countries and said such applications should be dealt with on their merits.

The argument was also made that the application should be rejected on the basis of the Commission's decision last year granting a certificate to Pacific North Pipeline Corporation to move gas into the U. S. Northwest and denying competing applications to import gas from Canada to serve the same area. Ivins declared that the cases are not parallel, because the Montana Power application does not include problems of construction or financing, and the company is not wholly dependent upon Canadian gas.

Ivins' decision is subject to full FPC review.

U. S. Hits It Big Offshore

Tucked away at the tail of a mimeographed government announcement last month were some figures that, with an easy stretch of the imagination, are sufficient to explain why there has been little said in Congress lately about who is going to pay the national debt.

It seems that a respectable chunk of it will be paid by offshore oil activity.

In announcing plans for the federal government's third offshore lease sale, likely to be held in July, the Bureau of Land Management declared that 486,869.86 acres of oil and gas lands and 25,000 acres of sulfur lands were leased off Louisiana and Texas in the first two sales. Bonuses totaled $140,969,005.48.

Thus, the government has received more than $1 in every $5 of the $650 million spent by the industry in operations off Louisiana and Texas, even ignoring taxes and rentals.

The report went on to say that 12 million acres off Louisiana and 8 million acres off Texas have been mapped as potentially leasable. If the acreage already leased is subtracted from this total, there remain 19,488,130 potentially leasable acres. By applying to this figure the same dollar rate paid thus far the government's total take in bonuses alone would be $5,367,031,268.

This is equivalent to more than one-tenth the total investment of the entire oil industry.

Compensation Bill Advances

Two changes were recommended last month during committee consideration of the proposed amendments to the Texas compensation laws introduced in both houses of the Texas Legislature in January by Sen. Searcy Bracewell and Rep. Garth Bates, both of Houston. The legislation introduced would correct abuses in state compensation laws, resulting in more reasonable insurance rates in the oil industry.

Floor consideration of the bills had not been scheduled late in the month.

Committee recommendations for these two amendments were announced:

- Removal of the proposed $2000 limit placed on attorneys fees in compensation cases appealed to the district court. The bills as introduced would make no change in the law allowing attorneys 15 percent of the first $1000 recovered and 10 percent thereafter for representing a claimant before the Industrial Accident Board. However, the proposed legislation asks that if the attorney elects to appeal to the district court, where he now is allowed 33⅓ percent of his client's award, he be limited to 25 percent of the amount recovered or a total fee of $2000, depending on which is the lesser.

- Another committee-suggested change would raise to $35 a week the present maximum allowance in order to adjust maximum employe benefits upward to conform with present economic conditions. Present maximum allowance is $25 a week, and the proposal was introduced as $30.

Other amendments contained in the bills, and which were approved in committee:

- Proposal to calculate benefits for partial disabilities based on the percentage of maximum benefits, rather than the wage rate.

- Proviso requiring that a compromise or settlement of a compensation claim must specify the weekly rate of benefits allowed and the number of weeks the settlement is intended to cover.

- Protection of employers in cases where an employe aggravates an old injury.

- Provision revising the law on compensation claims arising from travel. New bills propose that the test of a travel case must be the prime purpose for a trip.

- Proposal to bring about long-sought self insurance for financially responsible employers.

Hearings Held on Imports

The President's committee statement that excessive imports could damage the domestic economy prompted some large importing companies to announce cuts in their 1955 scheduled imports, limiting their totals to approximately the same as 1954.

In 1954 the major importing companies announced cuts in programmed imports, though for the year as a whole the total reached a new high, averaging 1,063,000 barrels daily.

Release of the committee's report at the end of February, some three months later than promised, came at a time when the debate on imports was at its highest tempo of recent years. The scene has been the hearings before the House Ways and Means Committee and more recently, the Senate Finance Committee, over the Eisenhower Administration requested extension of the Trade Agreements Act. Domestic producers are making their strongest plea for legislation that would establish specific restrictions on imports and have rallied behind an amendment to the trade bill, introduced by Sen. Matthew Neely, a coal state senator from West Virginia.

This bill would restrict total imports in any quarter to 10 percent of domestic demand in the corresponding quarter of the previous year and would specifically limit residual fuel imports in any quarter to 10 percent of the domestic demand of residual fuel in the like quarter of the preceding year. The bill is co-sponsored by 16 senators from coal and oil states.

Total petroleum imports in 1954 averaged 1,063,000 barrels daily, equivalent to 13.7 percent of the domestic demand (less exports), which amounted to an average of 7,744,000 barrels daily. Residual fuel oil imports averaged 353,449 barrels daily last year, or 24.7 percent of domestic demand for residual. Under the Neely amendment to the Trade Agreements Act, total imports would have been limited to 774,000 barrels daily, and residual fuel oil imports would have been held to 14,300 barrels daily.

Many domestic producers oppose such limitations on residual fuel oil imports since there is doubt that the necessary supplies of residual could be filled economically without a higher level of residual imports that would be permitted under the Neely amendment.

IN A FREE ECONOMY

When PRICE FIXING grabs one Industry... How long can others hold out?

PRECEDENT is being set for government price control of an industry. If price fixing by FPC could be accepted as applying to natural gas only, the decision of the Supreme Court in the Phillips case would be a matter of less national and individual concern. The threat in this throttling decision to other industry, and the sovereignty of States appalls most students of the Constitutional guarantees of free enterprise.

The Natural Gas Act of 1938 has this wording in its jurisdictional section:

"The provisions of this Act . . . shall not apply . . . to the production or gathering of natural gas."

In eleven instances the Federal Power Commission itself accepted this interpretation by ruling it had no authority to fix the price of gas in the field. One such decision in 1951 was carried into the courts as the Phillips case; and in June, 1954, the Supreme Court ruled that under other wording of the Statute, the Federal Power Commission can regulate or fix the price of gas sold by a producer to a natural gas (pipeline) company in an interstate sale.

The implications of this decision were summed up by Governor Allen Shivers of Texas before the Interstate Oil Compact Commission in Chicago, like this:

"The Supreme Court's rule, in the Phillips decision, overturns all the precedents of our national experience by removing from the States the right to exercise the police powers reserved to them by the Tenth Amendment as a part of the Sovereign Bill of Rights.

"This is a drastic change, an unwanted and an unwarranted change, a change which I do not believe the people of the United States are willing to accept . . . If the power of the federal government can reach to the well heads of oil and gas fields in Texas and Oklahoma . . . it can likewise reach to the crop rows of Iowa, the dairy sheds of Minnesota, the mine faces of Illinois and wholly change the character of private enterprise as well as the character of the government of this land of ours."

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Pipe Line Men

IN THE NEWS

W. J. Williamson

A. E. Groff

W. J. Williamson, former attorney for Shell Oil Company, has been named corporate secretary and a director of **Shell Pipe Line Corporation.** He replaces **A. E. Groff,** who retired after 31 years with the Shell companies.

F. W. Littell

Williamson worked with two Houston law firms before joining the staff of the general counsel for the U. S. Treasury Department in 1939. He joined Shell Oil in 1941 as tax attorney in the Insurance, Tax and Claims department in Houston, and, in 1946, transferred to the Legal department.

Groff joined Shell Oil in 1924 and moved to Dallas in 1930 as assistant land superintendent. In 1933 he transferred to Houston as assistant land manager, and, the following year, was made manager of the Legal department. He was elected secretary of Shell Pipe Line in 1940 and also served as manager of the Insurance-Tax-Claims department. He was elected to the company's board of directors in 1951.

The retirement of **F. W. Littell,** manager of Shell Pipe Lines' communications and transport facilities, has also been announced. With Shell for 35 years, he has held the top communications job in Shell Pipe Line since 1940.

•

At a special meeting of the board of directors of **Platte Pipe Line Company, J. D. McConnell,** Sinclair Pipe Line Company, Independence, Kansas, was elected a member of the board. He succeeds **H. L. Phillips,** Sinclair Oil Corporation, New York City.

D. J. McGanney

E. E. Mayo

Appointment of **D. J. McGanney** as president of the recently organized **Southern Pacific Pipe Lines, Inc.,** has been announced. **E. E. Mayo** has been named vice president.

McGanney started with Southern Pacific in 1911 in the Accounting department and has spent all of his working career with the railroad.

He was later in the Executive department, transferring to the Freight Traffic department in 1917. In 1926 he was named assistant general freight agent in San Francisco, advancing through other important freight traffic positions to freight traffic manager of Southern Pacific's Central district with headquarters in San Francisco in 1942. In December of the same year he moved up to assistant vice president system freight traffic.

In 1943 he went to Chicago as general traffic manager for Southern Pacific Lines and in January, 1951, was appointed assistant to the president with headquarters in San Francisco.

McGanney became vice president of Southern Pacific Company January 1, 1952.

Mayo began his railroad engineering work in 1907 with the Pacific Railway and Navigation Company, now part of Southern Pacific's Lines in western Oregon.

He subsequently held engineering assignments with SP at Hillsboro and Portland, Oregon; Ogden, Utah; San Francisco, Sacramento and in Mexico.

Appointed chief engineer of Southern Pacific railroad's Pacific Lines in 1944, Mayo served in that position until this recent appointment as vice president, Southern Pacific Pipe Lines, Inc.

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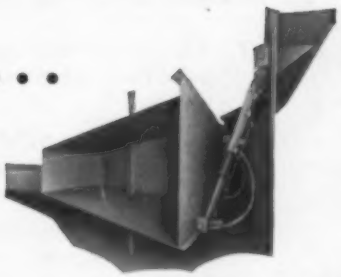

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For more data on advertised products, use Readers' Service Cards, last page.

R. J. Andress

T. R. Aude

R. P. Lennart

S. N. Williams

Election of **R. J. Andress** as executive vice president of the **Service Pipe Line Company** has been announced.

Andress was advanced from his position of vice president-traffic to the newly-created office. He joined Service in 1946 and was elected to its board of directors in 1948.

T. R. Aude, director, and former manager of Planning and Economics, was elected to succeed Andress. An engineer, he joined the company in 1930 and was elected to the board in 1948.

R. P. Lennart will replace Aude, and **S. N. Williams** will replace Lennart as supervisor of oil movements.

Lennart joined Service in 1946 as a mechanical engineer. He designed and supervised the construction of the Wyco Pipe Line System, a products pipe line from Casper, Wyo., to Denver. In 1947, he was promoted to senior engineer and became executive assistant to the general manager of the company. In 1950 he was made supervisor of oil movements.

Joining the company in 1930, Williams was promoted to head of a section in the Accounting department, and, in 1950, was made assistant supervisor of oil movements.

Hobart G. Mariner, former maintenance superintendent of **Service Pipe Line Company,** has been named assistant to the general manager. He joined the company in 1940 as a draftsman and instrument man, and, in 1945, was made specifications engineer. In 1947 he became head of the hydraulics section of the Engineering department, and was later promoted to manager of the Missouri division.

Hobart G. Mariner

Succeeding Mariner is **H. T. Chilton, Jr.,** executive assistant to the vice president of operations. Joining Service in 1945, he was made manager of the Missouri division in 1950. He recently served as consultant on the construction of a products pipe line across France.

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Harrington A. Rose has resigned as secretary of the General Management Section of the American Gas Association to accept a position in the Customer Relations department of **Transcontinental Gas Pipe Line Corporation.**

Rose joined AGA in 1954 after having served with Stone & Webster Service Corporation. He entered the gas business in 1947 with Conversions and Surveys, Inc.

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You save too with extra long lengths of Armco Pipe. There are fewer sections to handle and fewer joints to make over a given length of line.

Armco Welded Steel Pipe is recommended for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write us for complete data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4275 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

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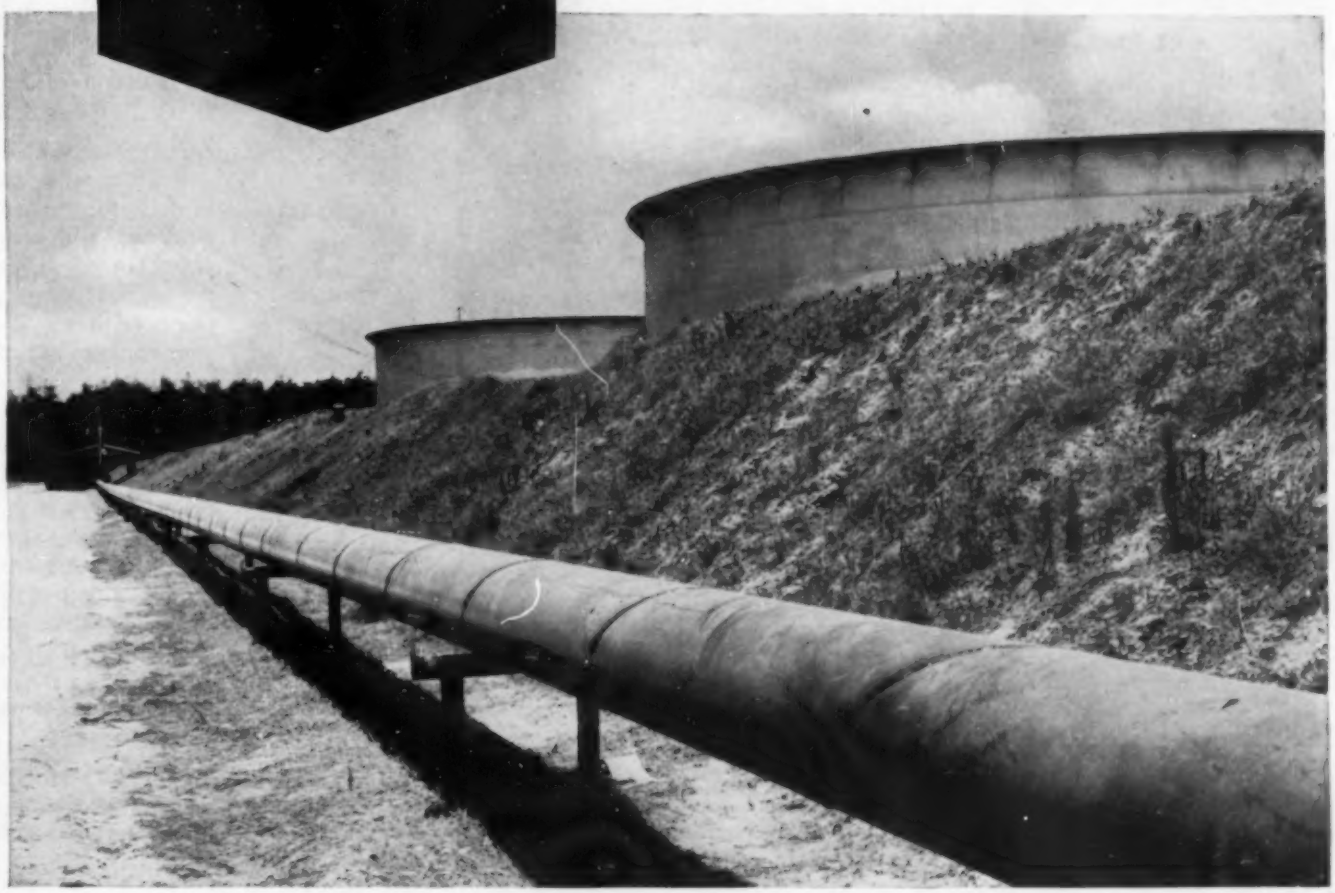
ARMCO



For more data on advertised products, use Readers' Service Cards, last page.

EMSCO TOWERS
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For dependable microwave operations, the top of the tower must be held steady under all weather conditions. The unique bridle guying and superior structural features of Emsco microwave towers assure minimum torsional deflection . . . minimum maintenance costs.
A pair of guys on each side of Emsco towers are anchored in a reverse direction. If the tower tends to twist because of wind, three of the guys will tighten and hold deflection of the tower top within specifications. Conventional guys are used on the lower part of the tower.
Every Emsco tower design meets RETMA specifications. Hot Dip Galvanizing provides protection against corrosion. Bolted construction permits quick, sure visual inspection.
For guyed or self-supporting towers unequaled for safety, structural rigidity and economy . . . specify Emsco. Prompt delivery is assured.
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DIRECTION OF TWIST DUE TO WIND
WIND DIRECTION
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EMSCO
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Another typical Emsco microwave installation on Texas Eastern's natural gas pipeline system.

Frank C. Anderson has been appointed assistant general manager of operations of the Domestic Pipe Line Department of the Gulf companies.

F. C. Anderson

He started with **Gulf Oil Corporation** as an office boy in 1933. In the past several years he has served on the administrative staffs in the production and pipe line operations of the Gulf companies and, most recently, has been serving as staff assistant to **J. H. Russell,** Gulf's vice president in charge of pipe lines for the U. S.

•

Andrew J. Sledge retired February 27 after 31 years of service with **Pan American Pipe Line Company.** For the past 14 years, he has been in charge of Pan American's main line station at Alvin, Texas. He began his employment at Hufsmith, Texas, with Stanolind Pipe Line Company on March 2, 1924, transferring to Pan American in 1940.

•

Frank Sesler, project engineer, **Ehrhart & Arthur, Inc.,** Los Angeles, has been transferred to Oakland, Calif., as manager of activities in the San Francisco Bay area.

Frank Sesler

Sesler, who has been with the engineering and construction firm for six years as project engineer, has a 15-year background of consulting engineering and construction work on refineries, chemical plants and pipe lines.

•

F. G. White, district superintendent of **Magnolia Pipe Line Company's** North Basin district, headquartered at Brownfield, Texas, has been promoted to assistant superintendent of the Northern division located at Oklahoma City.

A. W. Butler, who has been assistant superintendent of the North Basin district, succeeds White as superintendent at Brownfield.

Edward J. Mahoney Jr. has been elected a vice president of **Bechtel International Corporation** and of **Compania Bechtel, S. A.** He will work out of San Francisco headquarters. As special assistant to **S. D. Bechtel Jr.,** who is in charge of the Pipe Line division, Mahoney will give primary emphasis to relations with pipe line clients and to business development. Until now he has been head of the Mahoney Contracting Company, of Lansing, Mich., which he organized. This firm constructed a substantial volume of pipe lines in this country and Venezuela.

E. J. Mahoney

•

Pan American Pipe Line Company has announced several promotions and transfers in the company's Operating department.

Edwin W. Kearns, formerly division foreman, West Texas division, has been named administrative assistant of the department, with offices in Houston.

Paul B. Hayes, division gager at Snyder, Texas, has been promoted to division foreman of the West Texas division replacing Kearns. **Harold Hunt** who previously served as district foreman in the Reinecke area will replace Hayes at Snyder.

David E. Luddeke, division foreman at Tomball, Texas, has been transferred to the Northern division with headquarters at Longview. **James B. Johnson,** who has been maintenance foreman in the Valley division at Raymondville, will transfer to Alvin, Texas. He will be replaced by **John F. Rodgers,** warehouse foreman at Snyder.

Other transfers and promotions include: **Robert J. Quick,** named warehouse foreman at Snyder; **Martin W. Pynes,** replacing Quick as senior proration clerk; **L. B. Mulloy,** named chief station engineer at Sterling City, Texas; **Jay R. McMahon,** promoted to senior deliveryman at Tomball; and **M. L. Johnson,** replacing McMahon as gangpusher at Alvin.

In the engineering staff, **James W. Wilhelm,** mechanical engineer, has transferred to Longview, and **Philip J. Slover** and **J. R. Burdette** have transferred to Houston.

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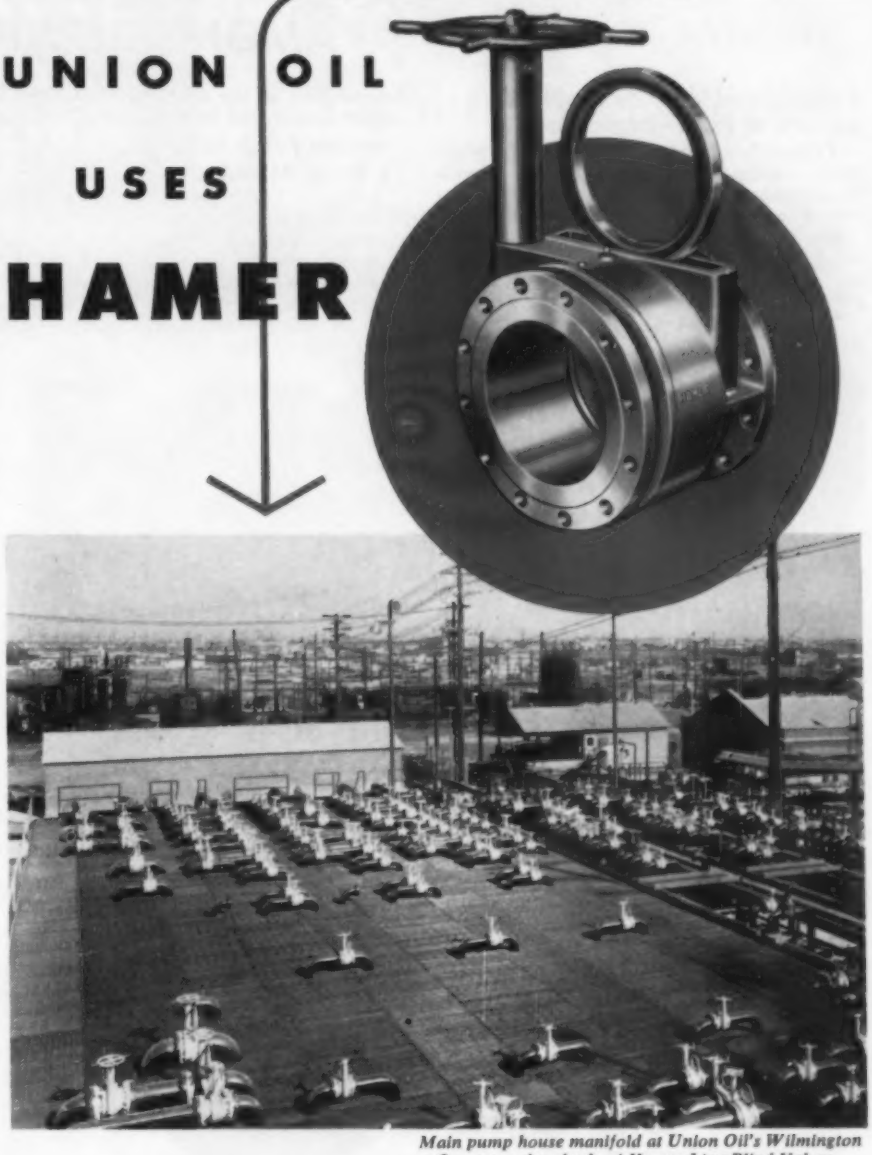

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Custom-crafted, Hamer Plugs welcome the tough applications where ordinary plug valves fall short. Standard dimensions. Readily installed.

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What's Happening

AMONG SERVICE AND SUPPLY MEN

Consolidated Machine Tool Made Division of Farrel-Birmingham

Consolidated Machine Tool Corporation, wholly-owned subsidiary of Farrel-Birmingham Company, Inc., has been dissolved as a separate corporation and, since January 1, has been operated as a division of the parent company. Activities will continue in the Rochester division as before and management will remain the same.

Farrel-Birmingham acquired Consolidated as a subsidiary in December, 1951, by purchase of the common stock from its former owner, the late Arthur H. Ingle.

Johnston Pump Sells To Emsco Manufacturing

Johnston Pump Company has sold most of its assets to Emsco Manufacturing Company of Los Angeles.

Approximately 85 percent of the outstanding stock of Emsco is owned by Youngstown Sheet and Tube Company and its wholly-owned subsidiary, Continental Supply Company.

Lyndus E. Harper

John R. Hartley

B-I-F Industries, Inc., Honor L. E. Harper and J. R. Hartley

Lyndus E. Harper, president of Omega Machine Company, and John R. Hartley, vice president and manager of project sales of Builders-Providence, Inc., received recognition and honor for 25 years of consecutive service at the annual B-I-F Industries awards dinner in February.

Harper has held all positions with Omega Machine Company from the shop to president. Hartley began as apprentice draftsman at Builders-Providence in 1929.

Caterpillar Tractor Names Pipe Line Representatives

Caterpillar Tractor Company has announced the appointment of D. F. (Don) Coonan, former earthmoving representative, as special pipe line representative in Domestic Sales.

Coonan will devote full time to working with Caterpillar dealers and pipe line contractors. As liaison man, his duties will embrace all pipe line operations in the U. S. and Canada.

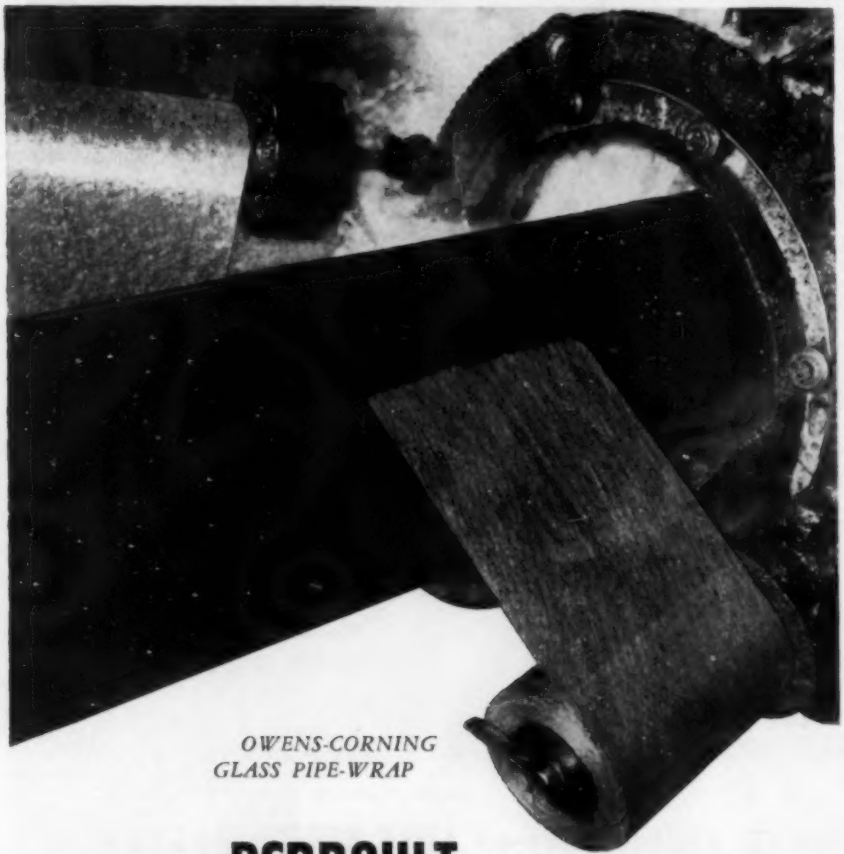
While serving as earthmoving representative in the Western division, Coonan contacted various earthmoving and pipe line contractors. His previous experience also includes assignments in Central Sales, Sales Training and Sales Development. He will make his headquarters at the company's main office in Peoria, Ill.

Parry Joins France Packing As Sales Representative

Ray E. Parry, formerly with Clark Bros. Co. in Olean, N. Y., has joined France Packing Company as sales representative. Parry joined the Clark organization after World War II and served in various capacities up to assistant manager of their Engineering department.

Ray E. Parry

France Packing Company, producers of mechanical compressor packing, industrial piston rings and valve plates, has appointed Parry a territory manager. He will operate in Michigan, Ohio, Indiana and Kentucky.



OWENS-CORNING GLASS PIPE-WRAP

POSITIVE PERRAULT PIPE PROTECTION

Owens-Corning Fiberglas Coromat pipeline wrap is available through Perrault Equipment Co. in average thicknesses of .020 and .025 in.; in widths from two to 18 in.; and roll lengths of 400, 800, and 1200 ft. High strength and porosity combined with inert reaction to weather, chemicals and electricity make this the best pipeline coating reinforcement. For the best service, get it from Perrault Equipment Co.

ALSO: Asbestos Pipeline Felt • Pipeline Kraft Wrap • Rock Shield

AND FOR DEPENDABLE APPLICATION: Perrault Line Travelling, Over-the-ditch, Coating and Wrapping Machines and Yard or Railhead Stationary Coating and Wrapping Machines.

ALSO: Cleaning and Priming Machines • Tar-Heating Kettles • Beveling Machines • Digging Teeth • Tongs • Welding Clamps • Line-Up Clamps • General Pipeline Hand Tools and Supplies . . .

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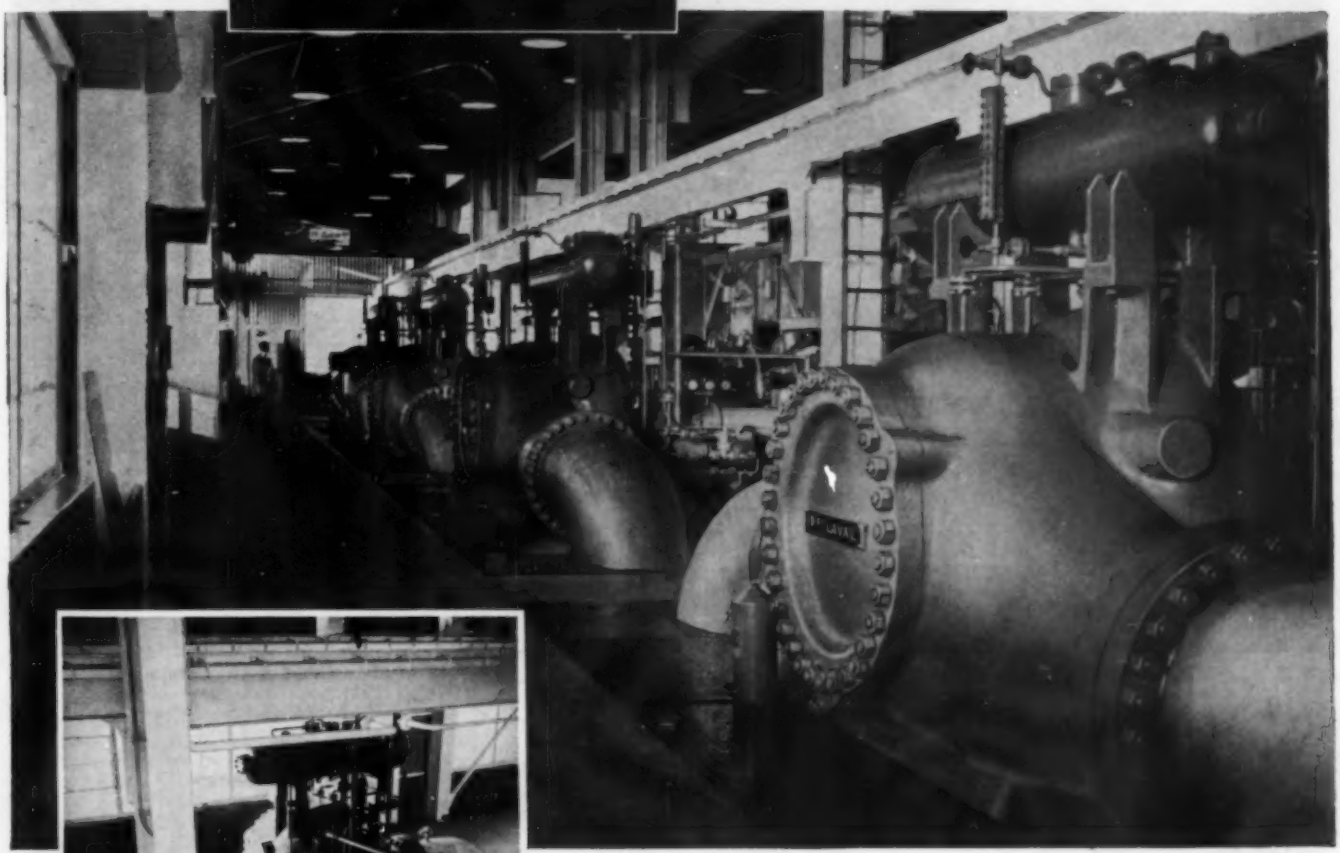
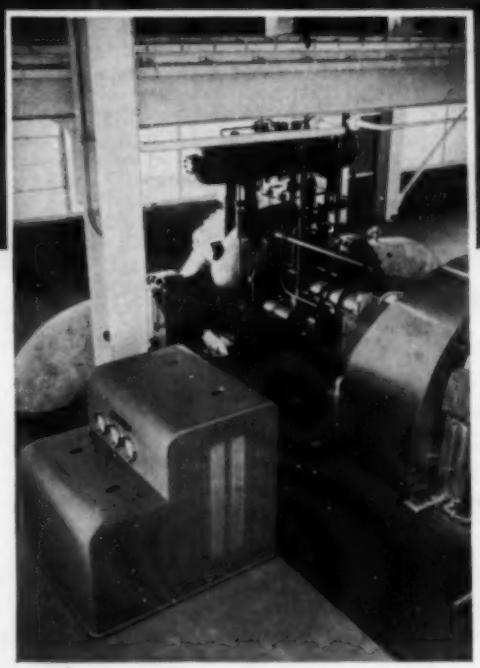
For more data on advertised products, use Readers' Service Cards, last page.

FOUR

DE LAVAL
CENTRIFUGAL
COMPRESSORS

in Tescott, Kansas station of Northern Natural Gas





For easy installation, De Laval pipeline compressors are designed in two packages: (1) The machine plus the emergency seal tank, (2) The auxiliary console which contains the filters, pumps, coolers and other accessories.

Here's more proof of the efficiency and dependability of De Laval centrifugal compressors for high pressure gas transmission. This Tescott, Kansas station of the Northern Natural Gas Co. has four De Laval centrifugal compressors in series.

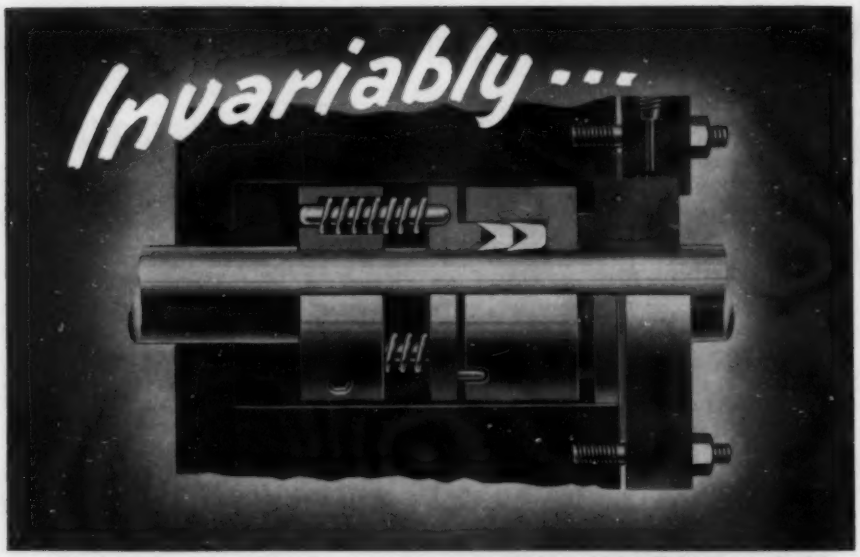
The station flow is 930 M²SCFD, station inlet pressure 477 psig and discharge pressure 745 psig. *By changing the impeller and a few minor parts, these units can handle 1,100 to 1,200 M²SCFD.* Three identical De Laval compressors are on the job in the Macksville, Kansas station of Northern Natural.

De Laval centrifugal compressors offer important engineering features. • Pressure contact shaft seal eliminates gas leakage. • Construction is heavy and rigid throughout. • Units have high load carrying capacity. De Laval units, totaling more than 200,000 hp, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
884 Nottingham Way, Trenton 2, New Jersey

DL308



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WHERE
....ECONOMICAL OPERATION IS DESIRED
....OPERATING CONDITIONS ARE HAZARDOUS
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....COMPLETE AND PERFECT SEALING REQUIRED

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DURAMETALLIC CORPORATION
KALAMAZOO MICHIGAN

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

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Robert F. Lay

G. C. Woodard

R. F. Lay and G. C. Woodard Promoted by Cooper-Bessemer

Robert F. Lay has been promoted to general sales manager of The Cooper-Bessemer Corporation, and Grant C. Woodard has been appointed assistant general sales manager.

Lay first became associated with Cooper-Bessemer in 1924 as a student at the University of Cincinnati. After service with Baldwin Locomotive Company and The Elliott Company, he returned to Cooper-Bessemer in 1946 as head of the Stationary Application Engineering section. He was named assistant general sales manager for all company products in 1954.

Woodard received basic training at the company's engineering facilities at the factory in Mount Vernon, Ohio. He then served as application engineer and sales manager.

Allis-Chalmers Begins Operation Of Baker Manufacturing Plants

Shareholders of the Baker Manufacturing Company, Springfield, Ill., have approved the sale of the company's assets to Allis-Chalmers Manufacturing Company.

Directors of Baker had previously approved the plan whereby all assets of Baker would be sold to Allis-Chalmers in exchange for Allis-Chalmers common stock.

Allis-Chalmers began operation of the Baker plants at Springfield and Beardstown, Ill., April 1, with all the Baker employes, except principal officers, continuing in their jobs.

Chapman Valve Elects Two Vice Presidents

At a recent meeting of the board of directors of Chapman Valve Manufacturing Company, David M. McIntosh was elected executive vice president and Frank A. Hunter was appointed vice president in charge of sales. McIntosh was also reappointed vice president in charge of production.

Humble Receives New Post At Dow Chemical Company

Hilary A. Humble, for five years product sales manager for cathodic protection activities, Magnesium department, The Dow Chemical Company, has been named product sales manager for primary magnesium ingot, magnesium alloy ingot, magnesium extrusion and rolling ingot, flux, and magnesium anodes.

Humble joined the Ethyl-Dow Chemical Company at Wilmington, N. C., in 1933. In 1945 he moved to Dow to engage in research in cathodic protection in the company's metals protection laboratory. In 1949 he became product sales manager for cathodic protection.

In his new position Humble will be assisted by R. L. Featherly, who will assume additional responsibility in the field of cathodic protection.

Digging the pipeline trench was one of the toughest equipment assignments which many of the men on the spread had ever seen. Between 40 and 50% of the ditch was dug in rock.

The deep grousers on tractor-type treads of the 22-B provide the bite and traction to climb grades easily. These treads also raise ground clearance to 20¾-in.—high enough to clear rocks and other obstructions along the right-of-way.

Pushing Pipe Over The Continental Divide

Laying a 30-in. gas line over a 7,000-ft. mountain in winter temperatures as low as 10° below zero is a job for experienced men and tough machines. R. H. Fulton and Co. had plenty of both when they tackled a 252-mile assignment on the leg between Corona and Gallup, N. Mexico.

Eight Bucyrus-Erie 22-B dragshovels were used for trenching. These machines turned in remarkable endurance records, working on steep and rocky terrain. The total excavation ran about 3½ million yards, most of it blasted malapai, broken limestone and varying sandy soils. Spread Supt. Boyd was particularly pleased with the high percentage of operating time of the 22-B's — 92 per cent.

Other Bucyrus-Erie equipment on this job included a 15-B and 22-B clamshell and a 22-B Transit Crane.

Bucyrus-Erie excavators with tractor-type treads can bring time- and cost-cutting performance to your pipeline jobs. See your Bucyrus-Erie distributor for all details.

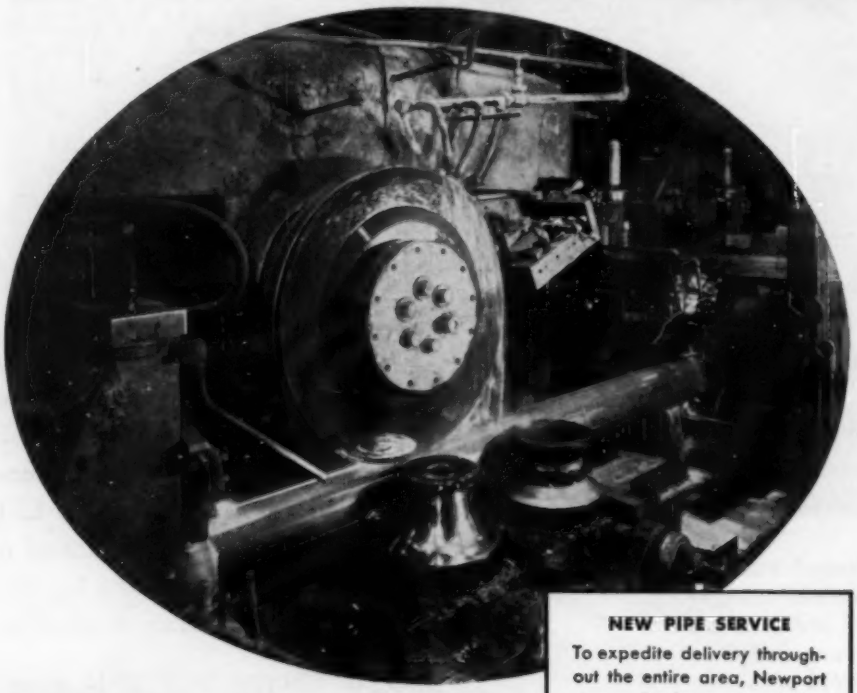
118E55

BUCYRUS ERIE

South Milwaukee, Wisconsin

Newport Steel LINE PIPE

QUALITY PROVED



NEW PIPE SERVICE

To expedite delivery throughout the entire area, Newport now maintains representative sizes and weights in their Houston depot.

Into every foot of Newport's electric weld line pipe go finer steel, controlled rolling and exacting testing, plus the priceless ingredient of 70 years' steelmaking experience. The unusual quality of steel refined in Newport's electric furnaces produces economical thin-wall pipe which exceeds API and ASTM requirements. Here at Newport the entire pipemaking facilities are devoted to 4" and 6" sizes*, standard or thin-wall, in quality and quantity to meet your exact requirements. Call on Newport for economical dependable service on line pipe, or any other of the products listed.

* SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

NEWPORT PRODUCTS

Cold-Rolled Sheets
Hot-Rolled Steel in Coil
Hot-Rolled Pickled Steel in Coil
Hot-Rolled Sheets
Hot-Rolled Pickled Sheets
Galvanized Sheets
Galvannealed Sheets
Colorbond Sheets
Electrical Sheets
Alloy Sheets and Plates
Electric Weld Line Pipe
Roofing and Siding
Eave Trough and Conductor Pipe
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ECONOMICAL WATERAIL DELIVERY

Newport Steel is situated on the Mississippi-Ohio River system and the great Cincinnati rail hub. With the advantage of location, new river barge facilities and seven major railroads, Newport gives economical, dependable delivery to the entire area of the Middle West and South.

Newport Steel CORPORATION
NEWPORT, KENTUCKY

YOUR CONFIDENCE IS JUSTIFIED WHERE THIS FLAG FLIES

A SUBSIDIARY OF MERRITT-CHAPMAN & SCOTT CORPORATION

G.E. Promotes Roy Burris In Gas Turbine Department

Roy E. Burris has been appointed manager-quality control in General Electric Company's Gas Turbine department. He is responsible for the organization and operation of all activities relating to mechanical inspection, test facilities and services and engineering for quality control.

Roy E. Burris

Joining the engineering training program of G. E. at Schenectady in 1948, Burris was later appointed head of tests for gas turbines. In 1951 he was transferred to the central test office as assistant general foreman of all turbine test sections.

After special assignments in the Gas Turbine department, he was named general foreman in the manufacturing section in 1953.

Allis-Chalmers Appoints Two Certified Service Shops

Appointment of two new certified service shops in Texas and Washington has been announced by Allis-Chalmers General Machinery division.

The American Armature Works, 7645 Navigation Boulevard, Houston, has been named a certified service shop for Allis-Chalmers motors and control in the company's Houston district territory. C. D. Schleyer is owner of the firm.

Picatti Brothers, 105 South Third Avenue, Yakima, has been named a certified service shop for Allis-Chalmers motors, control and transformers in Yakima, Benton, Grant, Franklin and Kittitas Counties in Washington. Joseph and George Picatti are partners in Picatti Brothers.

Iowa Manufacturing Firm Purchases Plant in Canada

Fisher Governor Company, Marshalltown, Iowa, manufacturers of automatic pressure and liquid level control equipment, has purchased a factory building in Woodstock, Ontario, Canada, and will start manufacturing operations there this spring.

The plant is a modern one-story building with 17,250 square feet of space. Fisher diaphragm motor valves, liquid level controllers and gas regulators will be manufactured there.

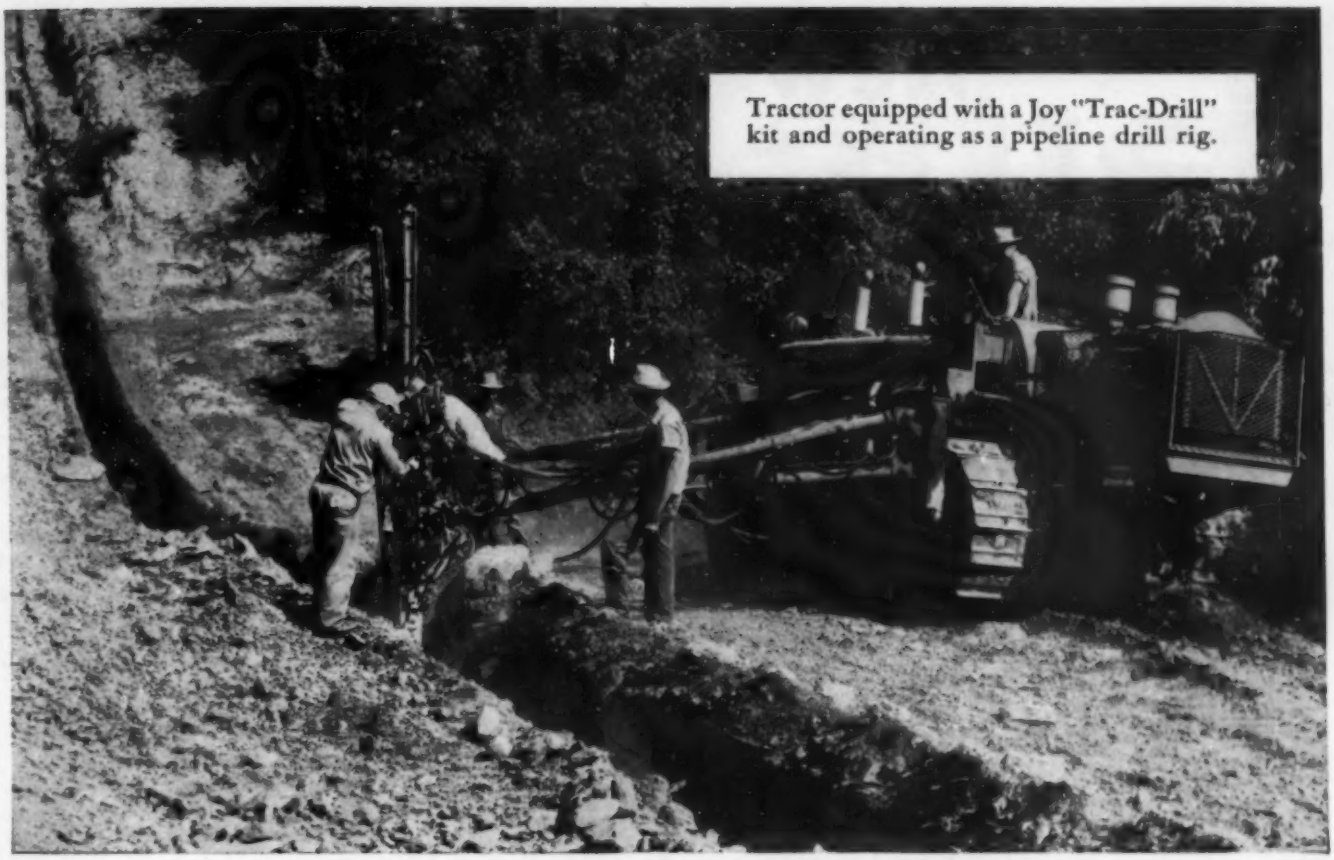
William J. Bestmann, formerly in charge of production scheduling in Marshalltown, has been named general manager of the Canadian plant.

Fisher Governor Company has Canadian sales engineering offices in Calgary, Edmonton, Vancouver, Winnipeg, Toronto and Montreal.

W. L. Somner Company Opens New Store in Louisiana

The W. L. Somner Company, Inc., Shreveport, has opened a new store in West Bridgehead, New Orleans.

Johnnie Beeson, who has been with the company since 1946, has been named district manager for the area. The new store will offer sales, service and a complete stock of Gaso pumps and parts.



Tractor equipped with a Joy "Trac-Drill" kit and operating as a pipeline drill rig.

THE JOY "TRAC-DRILL"

A PIPELINER RIG THAT GETS THERE FASTER TO SAVE YOU TIME AND MONEY

This PIPELINER, the Joy "Trac-Drill," is a packaged drill-and-compressor unit for pipeline drilling that is easily assembled on *your* tractor. The assembly kit consists of drill and compressor "packages" and instructions for assembly. Drill package includes Joy Silver Streak Drills, Hydro Drill Jibs, mounting bracket, hydraulic pump and other accessories. Compressor package includes a Joy WL-80 compressor, mounting bracket, air receivers, etc.

Two drills are mounted on dual, hydraulically-actuated Joy Hydro Drill Jibs. With these jibs, the drills are quickly and easily positioned and are held absolutely stationary during drilling. This is a real "Pipeliner" rig . . . the double drill arrangement permits the drilling of several holes from each tractor setup.

The Joy "Trac-Drill" moves and operates as one self-contained unit. It moves in on those tough spots in the spread faster because there is no need to tow a separate source of compressed air into the area.

Consult a Joy Engineer TODAY for details on how you may equip your tractor for pipeline drilling. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

ABOUT Stationary and Portable Compressors . . . Rock Drills . . . Rock Bits . . . Electrical Connectors . . . Portable Lighting Lines.

WAD C-5363

JOY

CONSTRUCTION EQUIPMENT MANUFACTURERS FOR OVER HALF A CENTURY

New RIDGID 200 Tripod Power Drive

with SPEED CHUCK

Light Weight...
Easily Quickly Set Up...
Built-In Folding Tool Tray and Folding Legs

Power for any hand pipe tools — ⅛″ to 2″ pipe, ¼″ to 2″ bolts; geared tools to 12″.

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Leg Spacing and Tool Tray assure solid rigidity, greater strength . . . No front leg to obstruct swing of die stock handles.

Fast Easy Chucking, new principle—guaranteed to grip tight both forward and reverse, won't slip, even with geared tools . . . 3-jaw centering device turns with pipe . . . Extra-powerful motor, larger brushes, longer commutator.

Your Supply House has it—
ready to demonstrate and expedite your order.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

Worthington Appoints Zachry Southwestern Representative

James B. Zachry has been appointed Worthington Corporation special southwestern representative in charge of sales to gas pipe line companies.

Associated with shop testing, application and sales of engines since joining Worthington in 1939, he is an engine specialist and has been assigned to the Southwestern regional sales organization for the past year to assist Worthington district offices in Tulsa, Dallas, Houston, New Orleans and El Paso in the sale of power engines and gas engine compressors.

Zachry will continue to make his headquarters at Houston. In addition to his new assignment, he will continue his former responsibilities.

General Electric Erects New Building in Tulsa

Completion of a new structure to house General Electric's welding sales branch at Tulsa has been announced. The building, which includes offices, service and warehouse facilities, will serve Colorado, Wyoming, Kansas, Arkansas and Oklahoma. Lester F. Douglas is manager of the Tulsa sales branch.

Dosch Heads District Office Of Pacific Coast Borax

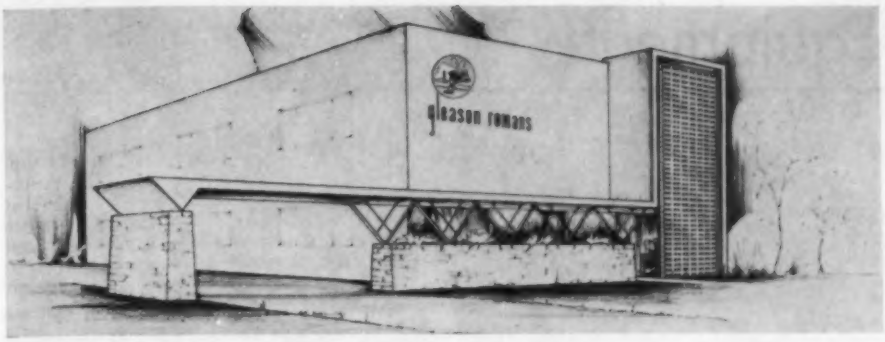
The Pacific Coast Borax Company's Agricultural Sales division announces the appointment of F. M. Dosch as manager of its district office in Kansas City. Dosch has been associated with Pacific Coast Borax since 1950. He has been stationed at field offices in Sioux City, Amarillo and Kansas City.

Elliott Named President Of J&L Supply Division

Rainey Elliott has been named president of the Supply division of Jones & Laughlin Steel Corporation. General manager of the division since 1952, he had been vice president and director of the J&L Supply Company prior to its incorporation into J&L as a division.

Elliott joined the organization in 1935 as a local store manager in Electra, Texas. Subsequently he was a salesman in Turnertown and Dallas and in 1941 was named sales manager.

"Stop wiggling your fingers and tell me what makes you think he objects to our pipe line crossing his property."



Pipeline Patrol To Move Into New Building

New headquarters for Pipeline Patrol Company and other interests of Gleason Romans, president, is here shown in an artist's sketch. The building is located at 2820 North Sheridan Road, Tulsa. Lower level of the building will include five offices and a lounge-reception room.

Burgess-Manning Announces New Officers and Directors

Following the merger of Penn Industrial Instrument Corporation into Burgess-Manning Company, the election of additional officers and directors and promotions in the Libertyville and Dallas divisions have been announced.

W. C. Bennett and S. G. Paddock were elected vice presidents, and Bennett and William Melas were elected directors. L. S. Kurtzhalz was named assistant secretary, and H. A. Dietrich was promoted to manager of the Libertyville division.

Bennett was president of the Penn Corporation, Melas, vice president and treasurer, and Kurtzhalz, secretary, prior to the merger. Paddock is manager of the Dallas division of Burgess-Manning and general sales manager.

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET-LINE®

PIPE SADDLES AND REDUCERS

Nozzle sizes from ¼" to 24"

ASTM A234

Also for pressure vessel heads

Nominal pipe sizes 1" to 30"

Special sizes and lengths. Schedules 10 to 160

ASA B16.9
ASTM A234

Immediate Delivery

STEEL FORGINGS, Inc.

P. O. Box 276K • Shreveport, La.

Foot of Fannin Street

Officials Attend Opening

Leading officials of Dresser Industries, Inc., and Clark Bros. Company, a subsidiary, view a picture of a new Clark turbo-charged compressor during the official opening of Clark Bros. offices and warehouse in Tulsa. Left to right, H. N. Mallon, president, and J. B. O'Connor, executive vice-president, Dresser Industries, Dallas; J. N. MacKendrick, Olean, N. Y., president, and W. H. Barnes, Tulsa, district manager, Clark Bros., and E. L. Andrews, director of facilities for Dresser.

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.

P. O. BOX 276K

SHREVEPORT, LOUISIANA

NOTICE: Specify PELCO Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

PELICAN SUPPLY CO. INC.

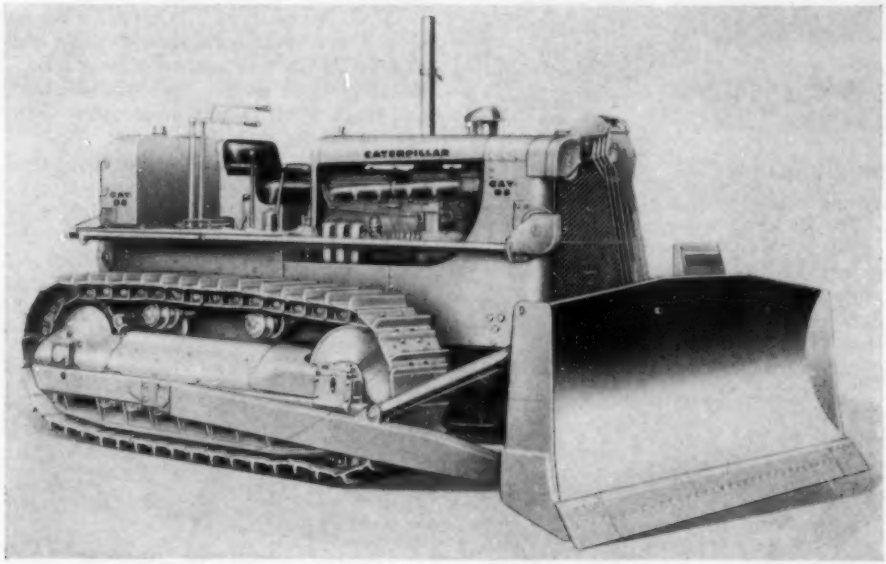
P. O. Drawer 1108 Shreveport (84), La.

SEE YOUR NEAREST SUPPLY HOUSE

For more data on advertised products, use Readers' Service Cards, last page.

What's New in Equipment

for the Pipe Line Industry



New Cat

A new D8 Tractor, recently introduced by Caterpillar Tractor Company, is being offered in two models.

The two D8 models have different drives —a torque converter (Series D) and a direct drive (Series E)—making this earth-moving workhorse even more versatile on the many jobs found in the pipe line industry.

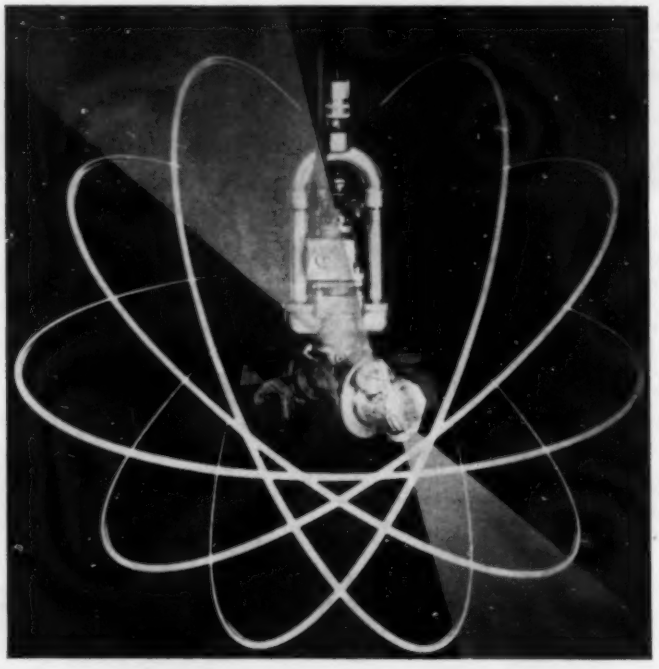
The Series D has speeds up to 7.4 miles per hour through a constant mesh transmission which has three speeds forward and three in reverse. The direct drive, Series E, has five speeds forward and three in reverse.

With a standard transmission on the Series E, the rated drawbar pull is 39,150 pounds. Optional transmissions will give still higher drawbar pulls. The Series D offers over 50,000 pounds of drawbar pull. However, the torque converter drive on the Series D automatically adjusts drawbar pull to the load within the given speed ranges.

Among the many new features of the new D8 are: New fuel injection system with capsule-type injection valves; flanged center main bearing to take crankshaft thrust; timing gear integral with crankshaft; new water pump and larger cylinder block water passages to handle greater capacity; larger capacity oil manifold to reduce restriction of flow from filter base.

For greater operator convenience, the seat has been raised six inches and located on the left side of the platform. A streamlined hood has been designed to give the operator clear visibility of the track and/or the bulldozer on both sides of the tractor.

For more data circle **No. E1** on Readers' Service Card, last page this issue.



Hydraulic Tank Cleaner

A new tank cleaner providing three-dimensional rotation of a high-pressure hydraulic jet has been announced by the Sellers Injector Corporation. Designated Rotor Jet, this compact, lightweight device delivers two powerful streams of either hot or cold water with or without detergents over the entire inside surface of any shape tank.

In operation, the Rotor Jet is simply lowered through the tank access by its supply hose. The two jets, powered by venturi-injector, provide high velocity streams so that a scrubbing rather than a cascading action results. The jet head is rotated pneumatically, utilizing all hydraulic power for cleaning. The unit is completely controlled from outside, thus eliminating the necessity for workmen to enter the tank.

The Rotor Jet is available in three models for discharge capacities from 600 to 6000 gph.

For more data circle **No. E2** on Readers' Service Card, last page this issue.

High Potential Anode

Galvomag, a new magnesium alloy material supplying 20 to 30 percent more current than conventional magnesium anode alloys, has been introduced by Dow Chemical Company.

This material, because of its inherent electrochemical properties, has been designed to provide cathodic protection to pipe lines and other underground steel structures.

Two advantages for higher potential magnesium are: fewer anode installations necessary, and better protection in the higher resistivity soils.

For more data circle **No. E3** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Reader Service Cards, last page this issue.

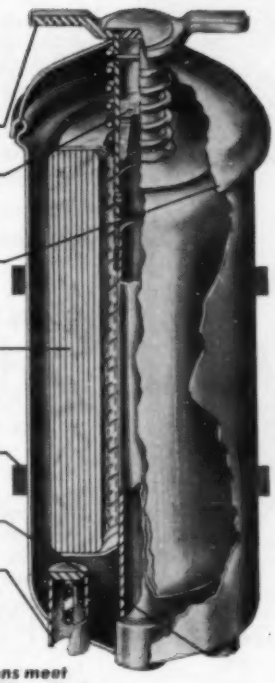
Your assurance of
EFFECTIVE FILTRATION

ENGINE LIFE

LUBE AND FUEL OIL
FILTER CASES

Guarantee **THE ULTIMATE IN OIL CONDITIONING!**

Check **THESE ENGINEERING FEATURES:**



- *Hand control* for quick servicing. No wrenches required.
- *Exclusive dual purpose by-pass design* insures full oil pressure for maximum engine protection and longer element life.
- *Functional "O" ring seal*—The greater the pressure, the greater the seal. Eliminates constant gasket replacement.
- *Elements* are designed to give a maximum of filtration, accomplished by the use of perfected filtering media in relation to service requirements.
- *Sturdy clamp-type mounting* for safe installation under all conditions.
- *Drain* is located at the bottom of oil sump.
- *Inlet at bottom* for ease and safety of installation. Inlet check valve prevents drainback and undesirable turbulence.

Over-all dimensions meet truck or industrial installation requirements.

FULL FLOW FILTRATION

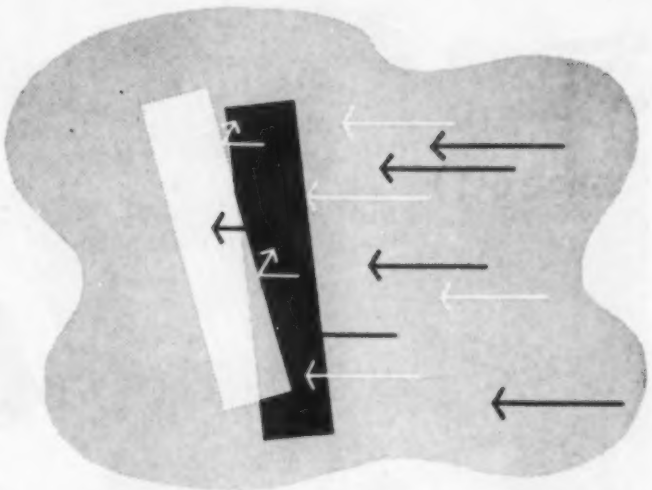
Oil conditioning and full flow protection to all precision working parts of the engine are incorporated in the same unit. Cases are designed so that new elements may be replaced in a matter of moments.

COMPLETE LINE OF ENGINEERED REPLACEMENT ELEMENTS

Request complete catalog listing all sizes and capacities of Engine Life Filter Cases.

ENGINE LIFE *Products Corporation*

EL MONTE — ENGINE LIFE — CALIFORNIA



Radioisotope Laboratory For Oil Industry Opened in Houston!

A radioisotope laboratory solely for supplying the petroleum industry with special tagged compounds has been opened in Houston at 2419 South Boulevard by Tracerlab, Inc. The laboratory will stock and ship on 24-hour notice all the short lived isotopes and standard tagged chemicals now being extensively used, and will thus overcome present serious delivery problems.

Tracerlab has been supplying compounds to oil companies for several years from its Boston, Massachusetts and Richmond, California laboratories. The growing volume of orders has made it practical to establish a special laboratory in a location more convenient for the majority of users.

Many standard compounds utilized by the oil industry are to be packaged and sold under the firm's trade names: TraceSols, which are radioisotope solutions or volatile or gaseous compounds; and TraceOids, which are radioactive isotopes in the form of particulates. These compounds can be shipped on 24-hour notice or less, if the ordering firm's general authorization from the Atomic Energy Commission is on file.

Descriptive sheets on TraceSols and TraceOids, complete with specifications, prices and illustrations of some of the applications, are available on request.

HOUSTON LABORATORY
2419 South Boulevard, Houston, Texas, Tel.: Jackson 9401

130 HIGH STREET, BOSTON 10, MASS. — *Tracerlab* — 2030 WRIGHT AVENUE, RICHMOND 3, CALIF.

WASHINGTON · NEW YORK · HOUSTON · CHICAGO · CLEVELAND · PARIS

Skilled workmen who laid a recent new crude oil line in Oklahoma were outspoken in their praise of Lone Star's line pipe. The sharp hills and deeply cut ravines of the Oklahoma landscape were extreme tests in bending quality and workability. Up to 40 degree bends in 50-foot sections caused not a single buckle.

Lone Star helped shorten the construction schedule. One veteran said, ". . . in no time, you're around the joint with a perfect weld – ready to move on."

Lone Star is the vast, new, permanent source of supply for the Mid-Continent oil and gas industry. Depend on Lone Star for API specification line pipe, casing and tubing. Quick delivery!

Lone Star STEEL COMPANY

LSS

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COAL MINES
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Aluminum-Coated Steel

Armco Steel Corporation has developed and is producing for commercial use a new type of aluminum-coated steel. Known as Armco aluminized steel (Type 2), it is said to combine the corrosion-resisting and heat reflecting qualities of aluminum with the strength of steel.

The company's first aluminum-coated steel, called aluminized steel (Type 1) has been produced exclusively by Armco for high temperature and heat reflecting applications only.

Both products are made by applying molten aluminum to cold rolled sheet steel by a patented continuous pre-treatment and immersion process. General reaction of Type 2 aluminized to atmospheric exposure is the same as that of solid aluminum. Samples of both materials exposed under the same conditions for five years cannot be told apart. Type 2 aluminized is reported to have the same high reflectivity of radiant heat as aluminum—whether from the sun or from low temperature heat sources such as are used to heat buildings. The coating on aluminized steel withstands temperatures up to 900° F. with no change and temperatures up to 1250° F. without serious damage to the coating.

The cost saving is credited to the fact that the greater strength of the steel base permits use of lighter gage.

The company claims that the cost of aluminized steel will be less than the cost of galvanized steel plus one field coat of paint. According to Armco, the new aluminum-coated steel does not require painting to extend its service life.

For more data circle **No. E4** on Readers' Service Card, last page this issue.

Heat Transfer Plastic

Thermon, a non-metallic plastic compound with highly efficient heat transfer properties, has been announced as available to the pipe line industry. This material is applied in a viscous paste form over either steam-traced or electrically-heated systems. When properly cured to a cement-like hardness, it bonds itself to the equipment and the heating element to form an unbroken thermal connection with maximum surface contact.

Thermon is equally applicable to pipes and to special equipment such as valves, pumps, etc. Thermonized equipment has been successfully used to handle molten sulfur, crude bottoms, tars and other viscous liquids.

The material can be supplied, ready mixed, in 12 or 65-pound cans with complete instructions or, on readily transportable items such as valves, pumps, fittings, etc., the material can be applied in the Thermon Manufacturing Company shops.

A brochure is available on both the material and the process.

For more data circle **No. E5** on Readers' Service Card, last page this issue.

Use the Readers' Service blue post cards on the last page of this issue for more information on advertised products.

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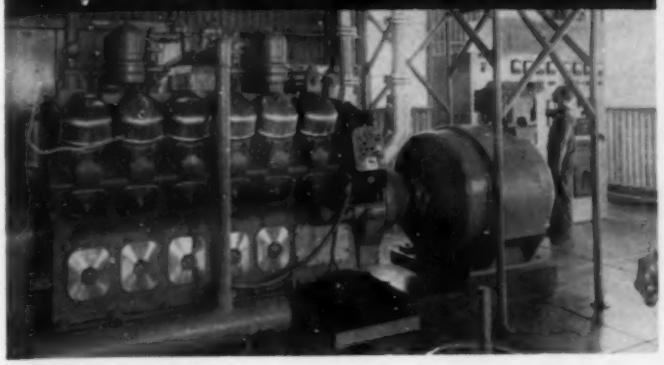

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Truck Tracks

Truck tracks like these of the P & G Supply Company have become widely adapted by contractors facing mobile problems in the mud, snow, sand and other rough going for trucks, tractors, cranes and similar rubber-tired heavy equipment. Standard tracks are 15 inches wide for single and tandem axles. Heavy-duty 18-inch tracks are available also for many larger size tires.

For more data circle **No. E6** on Readers' Service Card, last page this issue.

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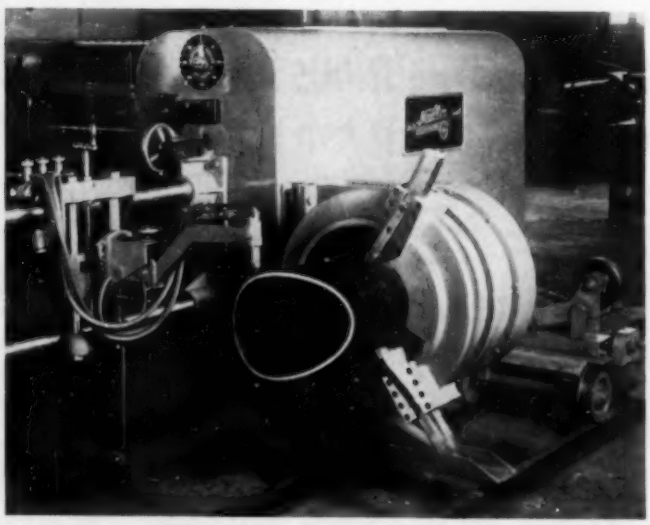

Pipe Cutting Machine

The J. u. W. Muller Company has recently announced the development of a new automatic Oxy-Acetylene pipe cutting machine for formed, straight and mitre cuts. The machine incorporates a simultaneous combination of circular, linear and angular movements of the workpiece and cutter and it functions automatically. During the cutting operation, the cutter maintains predetermined cutting angles throughout the generated length of cut, thus eliminating any trimming or adjustment by hand on subsequent welding operations.

In operation, the pipe is mounted concentrically in the chuck, the lever operating system adjusted in accordance with requirements from precalculated figures covering diameter of tube, angle of tube axis controlling length and width of cut, and cutting angle. The torch is ignited, and the machine is started by push button. The cutting operation is completed in a few minutes at which time the machine automatically stops.

For more data circle **No. E7** on Readers' Service Card, last page this issue.

Circle numbers on Readers' Service Cards on last page

New Catalogs and Equipment Literature

Research Brochure

Cook Research Laboratories, division of Cook Electric Company, has issued a brochure on their organizational setup and facilities for research in servomechanisms, nuclear physics, upper air studies, weather reconnaissance, radar, countermeasures, sonar, guided missiles, airborne electronic instruments, airborne fire control systems, electronic instrumentation, human engineering and general electro-mechanical developments. Also included is a description of the types of work carried on by the various sections and examples of research and development work on unclassified projects.

To get a copy circle **No. E8** on Readers' Service Card, last page this issue.

Mechanical Shaft Seals

Latest methods for sealing all types of rotating shafts in the chemical, petroleum and marine fields are described in a new catalog issued by Sealol Corporation. Sealol-Flexibox seals—for replacement of shaft packings or for installation as original equipment—work on a "balanced pressure" principle of shaft sealing, where extremely low face contact pressures in the seal are resiliently maintained by a patented spring drive. Detailed diagrams of all Sealol-Flexibox standard and modified designs are shown.

To get a copy circle **No. E9** on Readers' Service Card, last page this issue.

Combustion Gas Turbines

General Electric Company's combustion gas turbines for power generation and mechanical drive are described in a recently revised bulletin. Among the subjects covered are gas turbine-steam turbine cycles, mechanical drive applications, design features, control and governing and generators. The bulletin also lists tables of characteristics and dimensions and weights.

Models included are the single-shaft and two-shaft simple-cycle and the regenerative-cycle, two-shaft units.

To get a copy circle **No. E10** on Readers' Service Card, last page this issue.

Piping System Catalog

Ric-wiL, Incorporated has announced completion of a new catalog listing specifications and illustrations of Ric-wiL insulated piping sysetms for underground or overhead use.

Each of the five sections in the catalog, product, engineering, specifications, drawings and installations, has a tabbed lead page of contents for easy reference. All engineering and specifications are current as of February 1, 1955.

To get a copy circle **No. E11** on Readers' Service Card, last page this issue.

Excavator Crane Booklet

A new brochure describing the Hyster Hystaway Excavator-Crane mounted on new or used Caterpillar D6, D7 or D8 track-type tractors is available. The booklet explains on-the-job advantages of the Caterpiller-built tractor with dozer blade and Hystaway which can be converted to either shovel, backhoe, dragline, crane, clamshell or pile driver. Specifications for each Hystaway job attachment are given, and versatility in permitting tractor bulldozing without needing to remove the Hystaway is described.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

Chemical Feeder Bulletin

Proportioneers, Inc., division of B-I-F Industries, Inc., has issued a bulletin on "The Chlor-O-Mite Low Capacity Chemical Feeders, Models E and H." The bulletin shows the feeders and typical arrangements for constant rate, intermittent, flow-proportional and hydraulic pulse feeding.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

Write for complete information giving full specifications of your requirement

Here is the answer to your surge and noise problems created by engines, compressors and vacuum systems. Burgess-Manning "BE" Snubbers are engineered to your specific need — designed to reduce that annoying exhaust roar to a smooth, quiet, and harmless discharge —and ruggedly built and internally reinforced to resist explosive pressures.

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• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 20th (1953-54) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

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A SAFER FASTER MORE RUGGED SNATCH BLOCK

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LEBUS "TRUCKER'S" SNATCH BLOCK

Undoubtedly the Finest Snatch Block ever designed, constructed and presented to the industry. This new LeBus Block has been *engineered for all types of heavy trucking, construction and rigging work. Special emphasis* has been placed on *STRENGTH, SAFETY* and *EASE OF OPERATION.* Only TOP QUALITY carbon and alloy steels are used in the construction and all parts are drop forged, heat-treated and processed to withstand the most rugged service. Like previous LeBus blocks, the new "Trucker's" Snatch Block requires no tools other than your hands, and can be taken completely apart within a matter of seconds.

For more information write direct or have your supply source write for catalog page 1500 for complete information on the four sizes of LeBus Blocks.

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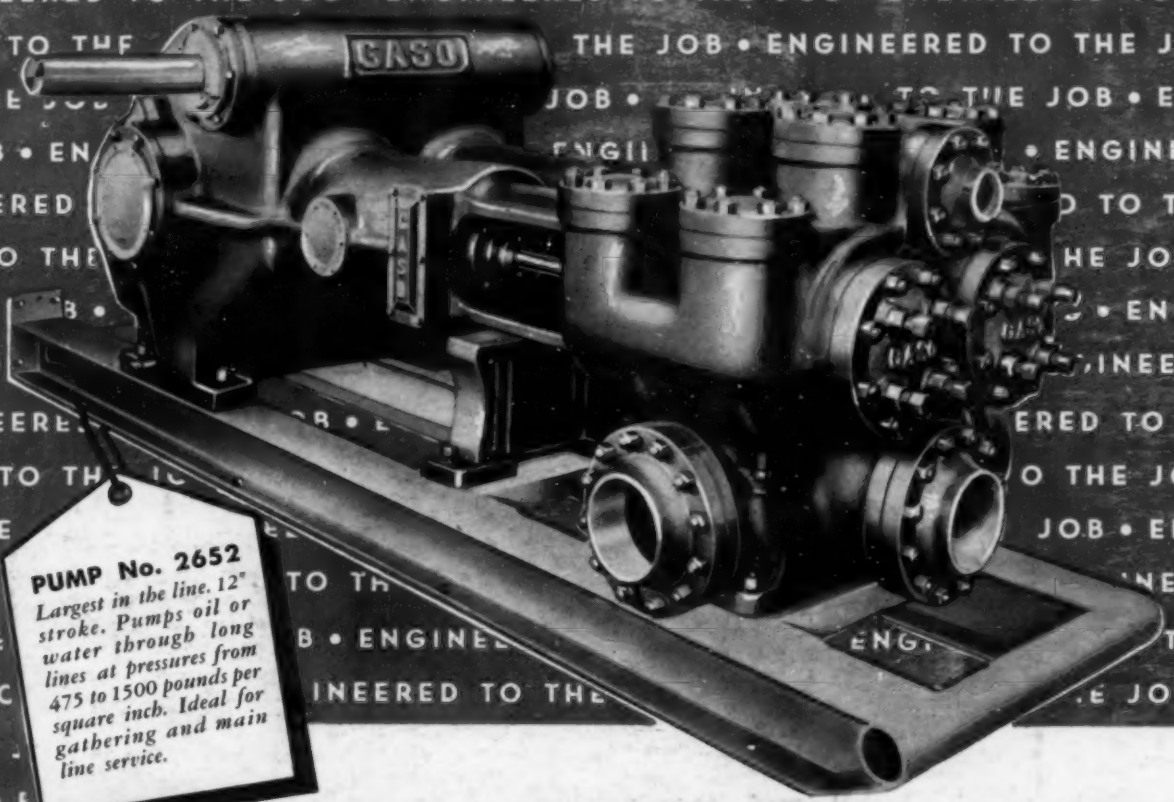
MAINTENANCE



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